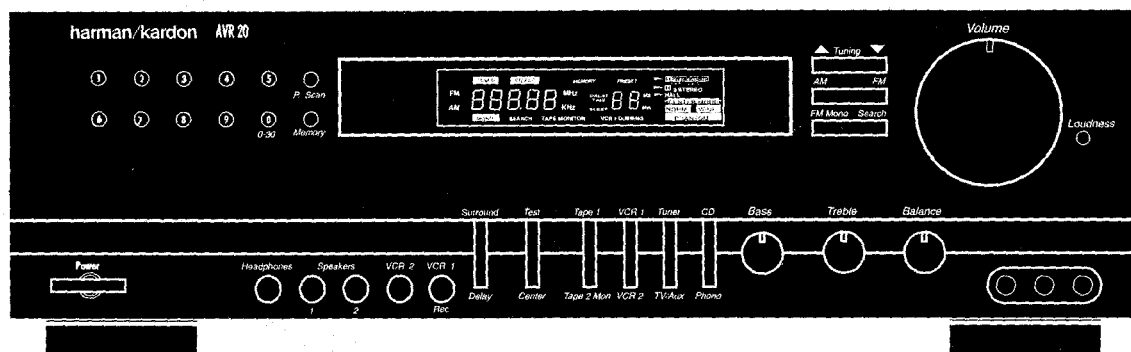


# The Harman Kardon Model AVR20 AUDIO AND VIDEO RECEIVER

Manual 188A

## Technical Manual



### ■ CONTENTS ■

SPECIFICATIONS .....	2	GENERAL UNIT .....	6
LEAKAGE TEST .....	2	P.C. BOARDS .....	8
CONTROLS AND FUNCTIONS .....	3	ELECTRICAL PARTS LIST .....	13
DISASSEMBLY PROCEDURES .....	4	BLOCK DIAGRAM .....	28
ALIGNMENT PROCEDURES .....	4	IC BLOCK DIAGRAMS .....	29
CIRCUIT DESCRIPTION .....	5	SCHEMATIC DIAGRAMS .....	32
GENERAL UNIT PARTS LIST .....	6	WIRING DIAGRAM .....	42

**harman/kardon**

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## SPECIFICATIONS

## ● FRONT AMP SECTION

RMS Output Power

(Stereo Mode) Input: CD

THD ( 0.09%, 8 ohms)  $\geq 65$  W  $\geq 63$  W

Both Channel Driven (40 Hz-10 kHz)

(Surround Mode)  $\geq 55$  W  $\geq 50$  W

THD ( 0.09%, 8 ohms, 1 kHz)

Im Distortion Input : CD  $\leq 0.2\%$   $\leq 0.3\%$ 

At 63 W, 60:7000 Hz = 4:1

THD (40Hz-10KHz) at 8 ohms, 63 W Input: CD

40 Hz  $\leq 0.06\%$   $\leq 0.09\%$ 1 kHz  $\leq 0.06\%$   $\leq 0.09\%$ 10 kHz  $\leq 0.06\%$   $\leq 0.09\%$ 

Input Sensitivity

Phono (MM) 2.5 mV  $\pm 0.4$  mVCD, AUX, VCR 150 mV  $\pm 30$  mV

S/N (WTD IHF-A) Input Shorted at Volume Max

Phono  $\geq 74$  dB  $\geq 70$  dBCD, Tape1, 2  $\geq 92$  dB  $\geq 90$  dBTV, VCR1, 2  $\geq 82$  dB  $\geq 80$  dB

Phono Overload at 1 kHz, THD: 0.5%

Phono Input  $\rightarrow$  Take Output  $\geq 140$  mV  $\geq 130$  mV

Phono Equalization

RIAA 30 Hz-15 kHz, Tape Mon, Output

RIAA dB  $\pm 1.5$  dB

Tone Control

Bass, 100 Hz  $\pm 10$  dB  $\pm 2$  dBTreble, 10 kHz  $\pm 10$  dB  $\pm 2$  dB

Loudness control at -40 dB

100 Hz +6 dB  $\pm 2$  dB10 kHz +3 dB  $\pm 2$  dB

Frequency Response

CD/AUX  $\pm 0.5$  dB  $\pm 1$  dB

Channel Crosstalk Input Shorted

1 kHz  $\geq 60$  dB  $\geq 50$  dB10 kHz  $\geq 50$  dB  $\geq 40$  dB

## ● CENTER AMP SECTION

RMS Output Power

THD < 0.3%, 8 ohms, 1 kHz  $\geq 55$  W  $\geq 50$  W

Only Center Channel Driven

S/N

Input Shorted, IHF A WTD  $\geq 67$  dB  $\geq 65$  dB

Line Input : 350 mV

Frequency Response at -3dB

Normal 100-20 kHz 150-15 kHz

Wide 20-20 kHz 50-15 kHz

## ● REAR AMP SECTION

RMS Output Power

(Both Rear Channels Connected)

THD < 0.7%, 16 ohms, 1 kHz  $\geq 27$  W  $\geq 25$  W

Only Rear Channel Driven

S/N

Input Shorted, IHF A WTD,

Delay: 20 mS, Line Input :350 mV

Dolby  $\geq 60$  dB  $\geq 55$  dBHall  $\geq 60$  dB  $\geq 55$  dB

Frequency Response at -3 dB 80-7 kHz 100-6 kHz

8 ohms, Dolby Pro-Logic

## ● VIDEO SECTION

Input Sensitivity/Impedance

VCR1, VCR2, VDP 1Vp-p/75  $\Omega$  dB  $\pm 1$  dB

Output Level/Impedance

VCR1, REC out, TV Monitor Out 1Vp-p/75  $\Omega$  dB  $\pm 1$  dB

Frequency Response -3dB

DC -10 MHz 5-16 MHz

Crosstalk at 1.0 MHz  $\geq 45$  dB  $\geq 40$  dB

## ● FM SECTION

Tuning Cover Range 50 kHz Step

Low 87.5 MHz

High 108.0 MHz

Usable Sensitivity

S/N 30 dB (Europe: 26 dB)  $\geq 11.2$  dBf  $\geq 17.2$  dBfImage Rejection (at 106 MHz)  $\geq 45$  dB  $\geq 35$  dB(Europe)  $\geq 100$  dB  $\geq 90$  dBIF Rejection (at 90 MHz)  $\geq 110$  dB  $\geq 100$  dBFull Limiting (at -3 dB)  $\leq 12.2$  dBf  $\leq 15.2$  dBf

50 dB Quieting Sen. at 98 MHz, 75 k DIV

IHF Band Pass Filter

Mono  $\leq 17.2$  dBf  $\leq 23.2$  dBfStereo  $\leq 40.3$  dBf  $\leq 43.3$  dBf

Distortion (1 kHz 100% MOD at 98 MHz)

IHF Band Pass Filter

Mono  $\leq 0.2\%$   $\leq 0.5\%$ Stereo  $\leq 0.4\%$   $\leq 0.7\%$ 

Signal-to-Noise (1 mV Input 100% MOD, at 98MHz)

IHF Band Pass Filter

Mono  $\geq 70$  dB  $\geq 65$  dBStereo  $\geq 65$  dB  $\geq 60$  dB

Frequency Response: +1, -3dB

AM-Rejection Ratio 20-15.5 kHz 30-15 kHz

(100  $\mu$ V-20mV Input)  $\geq 60$  dB  $\geq 50$  dBSearch Level (at 98 MHz) 29.2 dBf  $\pm 5$  dBf

Automatic Stereo Threshold (at 98 MHz)

29.2 dBf  $\pm 5$  dBf

	Nominal	Limit
Muting Threshold (at 98 MHz)	29.2 dBf	$\pm 5$ dBf
Overload at 98 MHz (100% MOD 100 mV RF Input)	$\leq 0.2\%$	$\leq 0.5\%$
Suprious Response (at 98 MHz Antenna Input 3 $\mu$ V)	$\geq 70$ dB	$\geq 60$ dB
Capture Ratio 40/60 dBf	$\leq 2$ dB	$\leq 2.5$ dB
Alternative Channel Selectivity (Input at 98 MHz)	$\geq 65$ dB	$\geq 55$ dB
	$\pm 400$ kHz	
Stereo Separation (100% MOD, 1 mV Input at 98 MHz)		
IHF Band Pass Filter		
100 Hz	$\geq 40$ dB	$\geq 35$ dB
1 KHz	$\geq 45$ dB	$\geq 40$ dB
10 KHz	$\geq 35$ dB	$\geq 30$ dB
Output Voltage (at 75 kHz DEV, 1 kHz MOD, 1 mV Input)		
Mono	500 mV	$\pm 150$ mV
Stereo	450 mV	$\pm 150$ mV

#### ● AM SECTION

Tuning Cover Range 10 kHz/9 kHz Step		
Low	520/522 kHz	
High	1710/1611 kHz	
Usable Sensitivity (400 Hz, 30% MOD, S/N 20 dB)	$\leq 500 \mu\text{V/m}$	$\leq 1000 \mu\text{V/m}$
Image Rejection (at 1400 kHz)	$\geq 35$ dB	$\geq 30$ dB
IF Rejection (at 600 kHz)	$\geq 60$ dB	$\geq 50$ dB
AGC Figure of Merit (From 100 mV/m at 1000 kHz)	$\geq 50$ dB	$\geq 45$ dB
Distortion (400 Hz, 30% MOD, 5 mV/m Input)	$\leq 0.8\%$	$\leq 1.5\%$
IF Bandwidth (6 dB Down, 350 $\mu\text{V/m}$ )	6 kHz	4-11 kHz
Audio Response (5 mV/m Input 1 kHz 0dB, 1000 kHz)	80 Hz	100 kHz
-6 dB	-2.3 kHz	2 kHz
Selecticity 350 $\mu\text{V/m} \pm 10$ kHz	$\geq 35$ dB	$\geq 25$ dB
Signal to NOise Ratio (1000 kHz, With Antenna Input 5 mV/m)	$\geq 45$ dB	$\geq 40$ dB
RF Overload 400 Hz	$\leq 5\%$	$\leq 10\%$
80% MOD, 100 mV/m Input		
Search Level (at 1000 kHz)	800 $\mu\text{V}$	$\pm 6\text{dB } \mu\text{V}$
Output Voltage (400 Hz 30% MOD 5 mV/m Input)	165 mV	$\pm 40$ mV
Whistle	$\leq 10\%$	$\leq 15\%$

#### ● GENERAL

Speaker Load Impedance:	8 $\Omega$
Power Consumption	
No Signal:	45 Watts
Full Signal at both Channels:	AC 120 V, 60 Hz, 180 Watts
	AC 230 V, 50 Hz, 500 Watts
Dimensions:	(W) 17.5/16 x (H) 4 7/8 x (D) 14 15/16 Inches
	(W) 440 x (H) 125 x (D) 380 mm
Weight:	23.59 lbs (10.7 kg)

**Note :** Nominal specs represent the design specs. All units should be able to approximate these-some will exceed and some may drop slightly below these specs. Limit specs represent the absolute worst condition that still might be considered acceptable; in no case should a unit fail to meet limit specs. This manual is based on the American standard wiring diagram, and information on regional component variations through use of parts list. Design and specifications subject to change without notice for improvement.

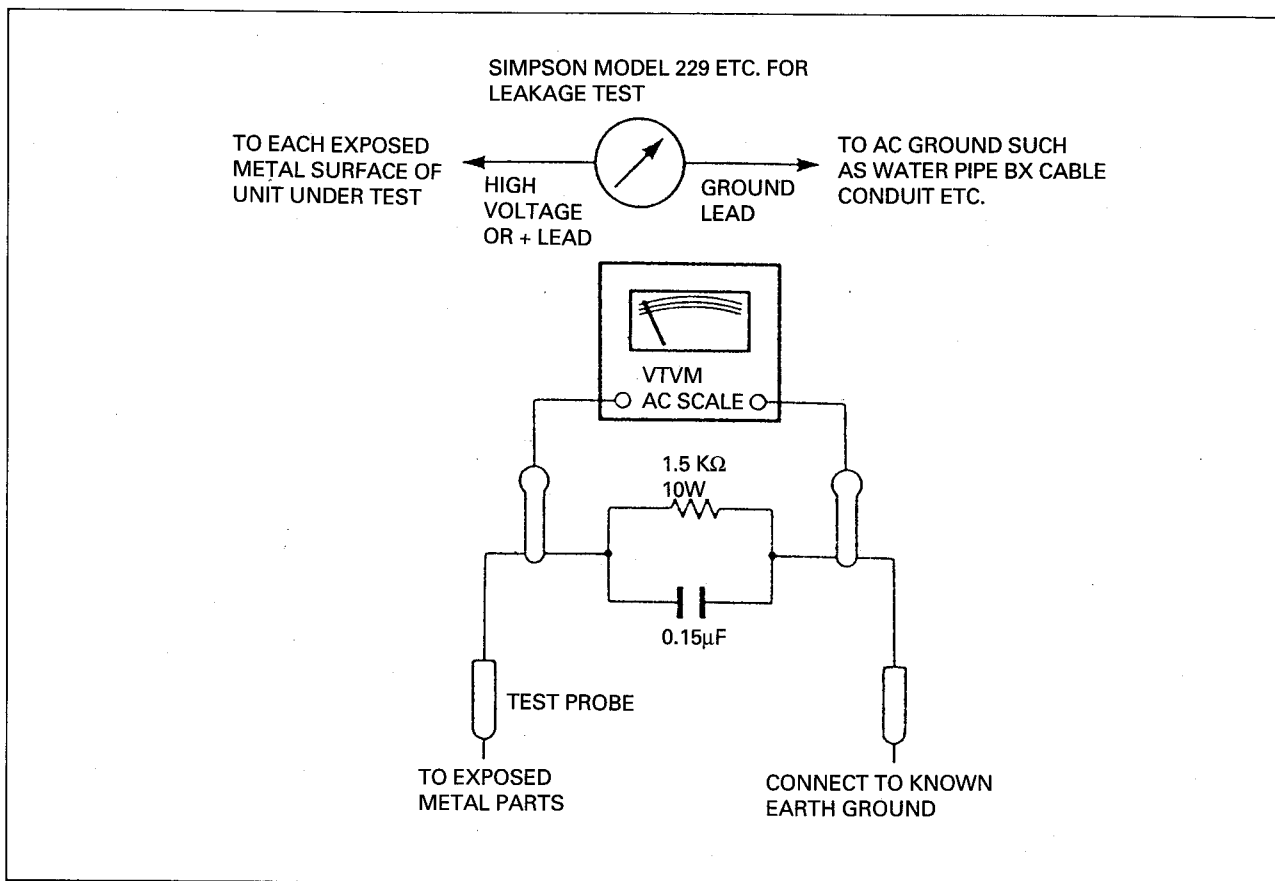
## LEAKAGE TEST

Before returning the unit to the user, perform the following safety checks:

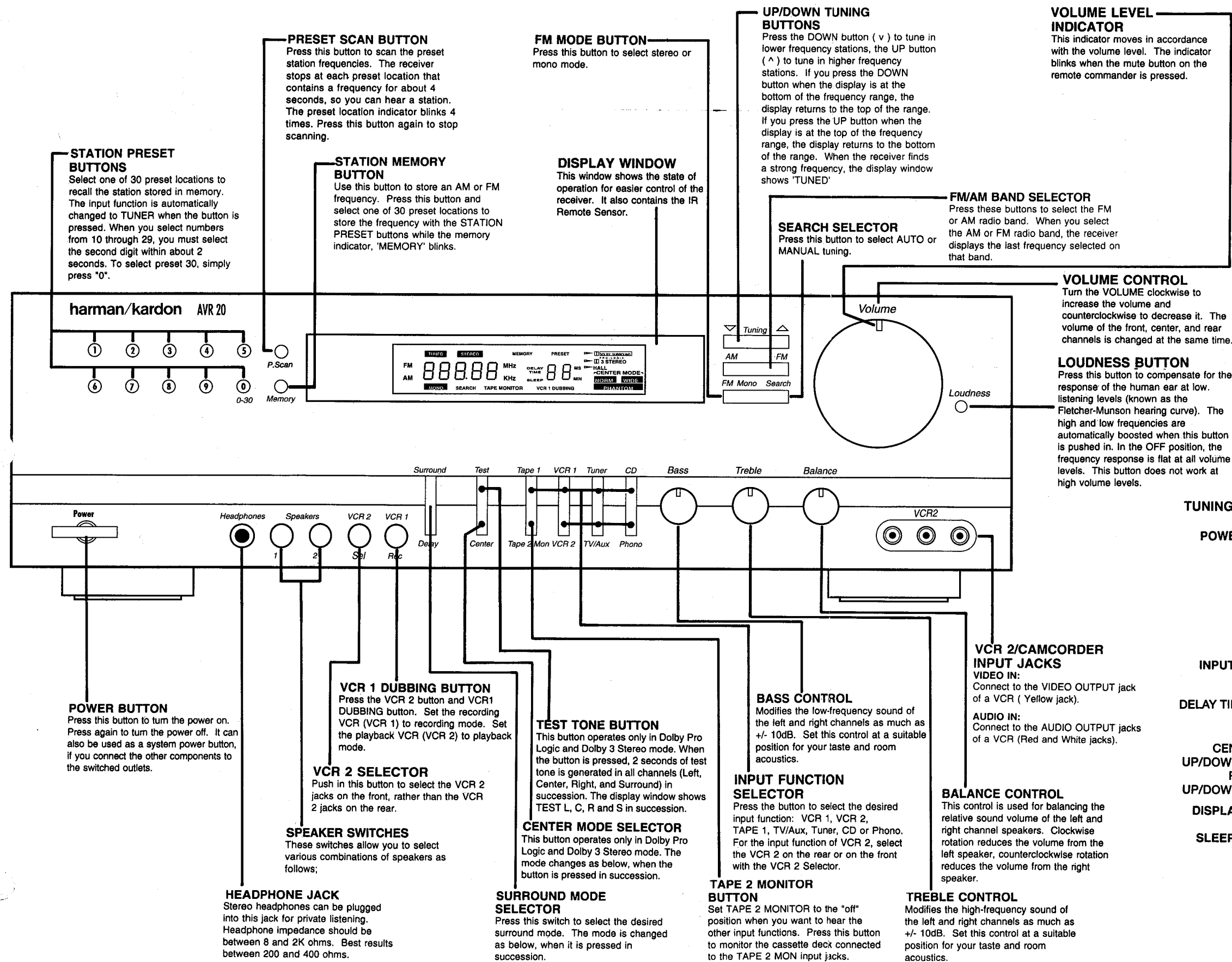
1. Inspect all lead dress to make certain that leads are not pinched or that hardware is not lodged between the chassis and other metal parts in the unit.
2. Be sure that any protective devices such as nonmetallic control knobs, insulating fishpapers, cabinet backs, adjustment and compartment covers or shields, isolation resistor-capacity networks, mechanical insulators, etc. Which were removed for servicing are properly reinstalled.
3. Be sure that no shock hazard exists; check for leakage current using Simpson Model 229 Leakage Tester, standard equipment item No. 21641, RCA Model WT540A or use alternate method as follows: Plug the power cord directly into a 120-volt AC receptacle (do not use an Isolation Transformer for this test).

Using two clip leads, connects a 1500 Ohm, 10-watt resistor paralleled by a 0.15 $\mu$ F capacitor, in series with all exposed metal cabinet parts and a known earth ground, such as a water pipe or conduit. Use a VTVM or VOM with 1000 Ohms per volt, or higher sensitivity to measure the AC voltage drop across the resistor. (See Diagram.) Move the resistor connection to each exposed metal part having a return path to the chassis (antenna, metal cabinet, screw heads, knobs and control shafts, escutcheon, etc.) and measure the AC voltage drop across the resistor. (This test should be performed with the power switch in both the On and Off positions.)

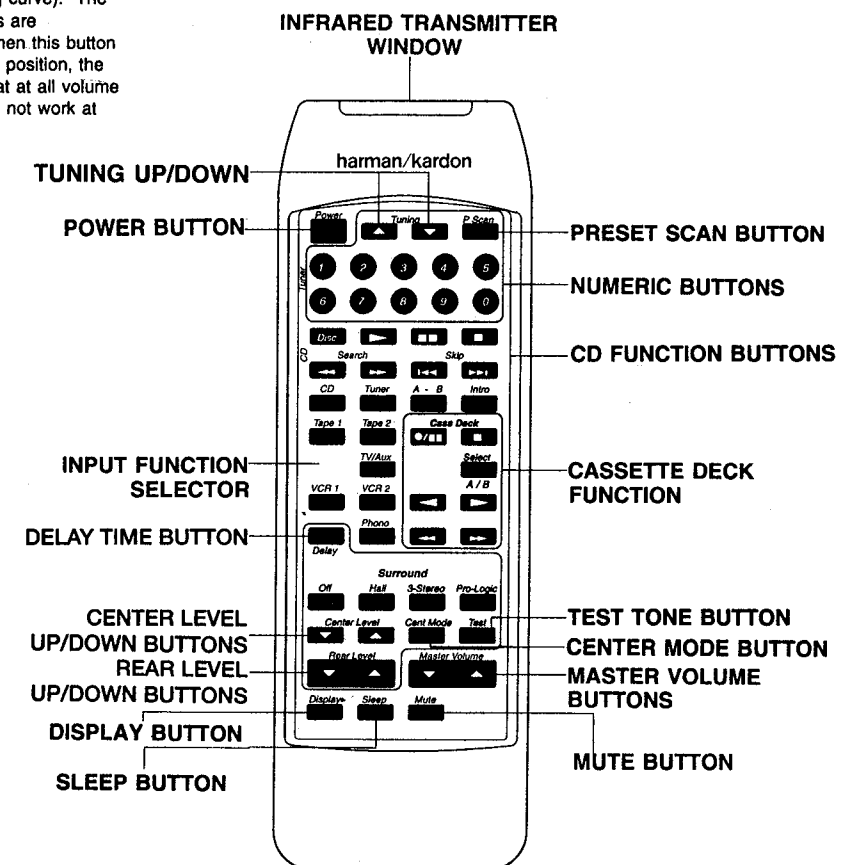
A reading of 0.35 volt RMS or more is excessive and indicates a potential shock hazard which must be corrected before returning the unit to the owner.



# CONTROL AND FUNCTIONS



## REMOTE CONTROL



## CONTROL AND FUNCTIONS

**STATION PRESET BUTTONS**

Select one of 30 preset locations to recall the station stored in memory. The input function is automatically changed to TUNER when the button is pressed. When you select numbers from 10 through 29, you must select the second digit within about 2 seconds. To select preset 30, simply press "0".

**PRESET SCAN BUTTON**

Press this button to scan the preset station frequencies. The receiver stops at each preset location that contains a frequency for about 4 seconds, so you can hear a station. The preset location indicator blinks 4 times. Press this button again to stop scanning.

**STATION MEMORY BUTTON**

Use this button to store an AM or FM frequency. Press this button and select one of 30 preset locations to store the frequency with the STATION PRESET buttons while the memory indicator, 'MEMORY' blinks.

**FM MODE BUTTON**

Press this button to select stereo or mono mode.

**DISPLAY WINDOW**

This window shows the state of operation for easier control of the receiver. It also contains the IR Remote Sensor.

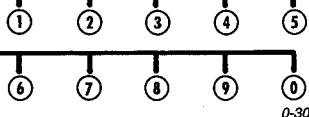
**UP/DOWN TUNING BUTTONS**

Press the DOWN button to tune to a lower frequency station. Press the UP button when the frequency display returns to the bottom of the range. If you press the UP button when the display is at the top of the range, the display returns to the bottom of the range. When a strong frequency is found, the display shows 'TUNED'.

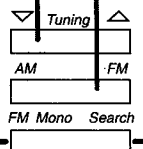
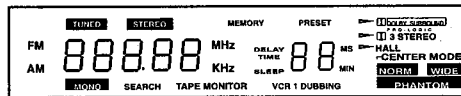
**SEARCH BUTTON**

Press this button to enter the MANUAL tuning mode.

harman/kardon AVR 20



P.Scan  
Memory

**POWER BUTTON**

Press this button to turn the power on. Press again to turn the power off. It can also be used as a system power button, if you connect the other components to the switched outlets.

**VCR 1 DUBBING BUTTON**

Press the VCR 2 button and VCR1 DUBBING button. Set the recording VCR (VCR 1) to recording mode. Set the playback VCR (VCR 2) to playback mode.

**VCR 2 SELECTOR**

Push in this button to select the VCR 2 jacks on the front, rather than the VCR 2 jacks on the rear.

**SPEAKER SWITCHES**

These switches allow you to select various combinations of speakers as follows;

**HEADPHONE JACK**

Stereo headphones can be plugged into this jack for private listening. Headphone impedance should be between 8 and 2K ohms. Best results between 200 and 400 ohms.

**TEST TONE BUTTON**

This button operates only in Dolby Pro Logic and Dolby 3 Stereo mode. When the button is pressed, 2 seconds of test tone is generated in all channels (Left, Center, Right, and Surround) in succession. The display window shows TEST L, C, R and S in succession.

**CENTER MODE SELECTOR**

This button operates only in Dolby Pro Logic and Dolby 3 Stereo mode. The mode changes as below, when the button is pressed in succession.

**SURROUND MODE SELECTOR**

Press this switch to select the desired surround mode. The mode is changed as below, when it is pressed in succession.

**BASS CONTROLS**

Modifies the low-frequency response of the left and right channels by +/- 10dB. Set the position for your room acoustics.

**INPUT FUNCTION SELECTOR**

Press the button to select the input function: VCR 1, TAPE 1, TV/Aux, Tuner. For the input function of the VCR 2 on the rear, press the VCR 2 Selector button.

**TAPE 2 MONITOR BUTTON**

Set TAPE 2 MONITOR to the position when you want to monitor the cassette deck to the TAPE 2 MON input jack.

## UP/DOWN TUNING BUTTONS

Press the DOWN button (v) to tune in lower frequency stations, the UP button (^) to tune in higher frequency stations. If you press the DOWN button when the display is at the bottom of the frequency range, the display returns to the top of the range. If you press the UP button when the display is at the top of the frequency range, the display returns to the bottom of the range. When the receiver finds a strong frequency, the display window shows 'TUNED'.

## VOLUME LEVEL INDICATOR

This indicator moves in accordance with the volume level. The indicator blinks when the mute button on the remote commander is pressed.

## FM/AM BAND SELECTOR

Press these buttons to select the FM or AM radio band. When you select the AM or FM radio band, the receiver displays the last frequency selected on that band.

## SEARCH SELECTOR

Press this button to select AUTO or MANUAL tuning.

## VOLUME CONTROL

Turn the VOLUME clockwise to increase the volume and counterclockwise to decrease it. The volume of the front, center, and rear channels is changed at the same time.

## LOUDNESS BUTTON

Press this button to compensate for the response of the human ear at low listening levels (known as the Fletcher-Munson hearing curve). The high and low frequencies are automatically boosted when this button is pushed in. In the OFF position, the frequency response is flat at all volume levels. This button does not work at high volume levels.

Loudness

Volume

Balance

VCR2

## VCR 2/CAMCORDER INPUT JACKS

**VIDEO IN:**  
Connect to the VIDEO OUTPUT jack of a VCR (Yellow jack).

**AUDIO IN:**  
Connect to the AUDIO OUTPUT jacks of a VCR (Red and White jacks).

## BALANCE CONTROL

This control is used for balancing the relative sound volume of the left and right channel speakers. Clockwise rotation reduces the volume from the left speaker, counterclockwise rotation reduces the volume from the right speaker.

## BASS CONTROL

Modifies the low-frequency sound of the left and right channels as much as +/- 10dB. Set this control at a suitable position for your taste and room acoustics.

## INPUT FUNCTION SELECTOR

Press the button to select the desired input function: VCR 1, VCR 2, PE 1, TV/Aux, Tuner, CD or Phono. For the input function of VCR 2, select VCR 2 on the rear or on the front of the VCR 2 Selector.

## 2 MONITOR ON

Set 2 MONITOR to the "off" position when you want to hear the output functions. Press this button or the cassette deck connected to the 2 MON input jacks.

## TREBLE CONTROL

Modifies the high-frequency sound of the left and right channels as much as +/- 10dB. Set this control at a suitable position for your taste and room acoustics.

## REMOTE CONTROL

### INFRARED TRANSMITTER WINDOW

### TUNING UP/DOWN

### POWER BUTTON

### PRESET SCAN BUTTON

### NUMERIC BUTTONS

### CD FUNCTION BUTTONS

### INPUT FUNCTION SELECTOR

### CASSETTE DECK FUNCTION

### DELAY TIME BUTTON

### CENTER LEVEL UP/DOWN BUTTONS

### TEST TONE BUTTON

### REAR LEVEL UP/DOWN BUTTONS

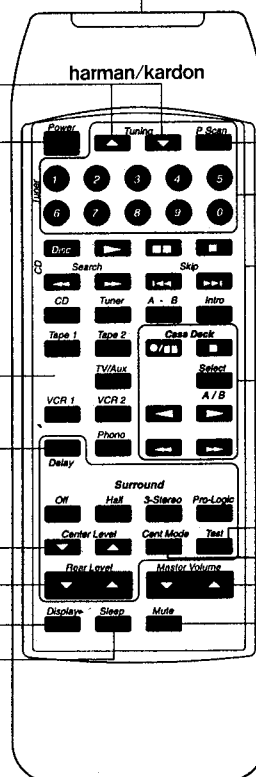
### CENTER MODE BUTTON

### DISPLAY BUTTON

### MASTER VOLUME BUTTONS

### SLEEP BUTTON

### MUTE BUTTON



## INSTRUMENT DISASSEMBLY

### MODEL NO. : AVR-20

NOTE: The item numbers given in the following procedures refer to the exploded view and parts list.

#### 1 Cover top removal

1. Remove 6 screws (S6) from the sides of chassis to release the cover top.
2. Remove 2 screws (S1) from the chassis back (item #34).
3. Carefully lift the cover top to remove.

#### 2 Cover bottom removal

1. Remove 10 screws (S7) from the chassis to release the cover bottom (item #29).
2. Carefully lift the cover bottom to remove.

#### 3 Panel Front Assembly removal

1. Remove the cover top.
2. Remove 4 screws (S4) from both side of panel front.
3. Remove 3 screws (S1) from the chassis front (item #50)
4. Disconnect CP102 from the volume PC Board.
5. Disconnect CNT602 from the surround PC Board.
6. Disconnect CP701 and CP702 from the input PC Board.
7. Disconnect CP703 from the video PC Board.
8. Remove 1 screw (S1) from the chassis right (item #31) for remove the lug wire.
9. Disconnect CP901, CP902 and CP402 from the main PC Board.
10. Remove the flat cable from the wafer (CP401) on input PC Board.

#### 4 Volume PC Board removal

1. Remove the panel front assembly.
2. Disconnect CP603 from Volume PC Board.
3. Pull the knob (main volume).
4. Remove the hex nut from the volume-motor (item #23) to release the volume PC Board.
5. Remove 2 screws (S1) from the panel front (item #1).
6. Pull the volume PC Board from the panel front assembly to remove.

#### 5 Speaker PC Board Removal

1. Remove the panel front assembly.
2. Remove 4 screws (S1) from the panel front (item #1) to release the headphone PC Board.

#### 6 Tone PC Board Removal

1. Remove the panel front assembly.
2. Pull out the knobs (bass, treble, balance) from

panel front assembly.

3. Remove the hex nut from the variable resistors (item #17 and 18).
4. Remove 4 screws (S4)
5. Remove the shield fence (item # 19).

#### 7 Front PC Board Removal

1. Remove the panel front assembly.
2. Remove 11 screws (S4) holding the front PC Board to release the panel front (item #1).

#### 8 Tuner PC Board Removal

1. Remove the cover top.
2. Remove 1 screw (S4) from the tuner PC Board fixed by bracket PCB (item #30)
3. Remove 2 screws (S8) holding the terminal antenna AM and FM (item # 33) to the chassis back (item # 34).

#### 9 Surround PC Board Removal

1. Remove 2 screws from the chassis back and chassis front (item # 50).
2. Disconnect CNT 602 from the surround PC Board.
3. Remove the surround PC Board.

#### 10 Video PC Board Removal

1. Remove the cover top.
2. Disconnect CP101, CP104 and CP703 from the video PC Board.
3. Disconnect CP301 from the main PC Board.
4. Remove 3 screws (S2).
5. Remove 2 screws (S8).

#### 11 Outlet PC Board Removal (Europe Only)

1. Remove the cover top.
2. Unsolder 2 leads of the AC-cord (item #53) from pin-L and pin-N on the outlet P.C. Board.
3. Remove 2 screws (S2) holding the PC Board.

#### 12 Chassis back Removal

1. Remove the cover top.
2. Do steps 8, 9 and 10.
3. Remove 6 screws (S2) holding the terminal speaker (item # 47) from the chassis back.
4. Remove 2 screws (S1) holding the bracket heatsink (item #42) from the chassis back.
5. Remove 4 screws (S1) from the chassis left (item # 49) and chassis right (item # 31).
6. Remove 1 (S1) screw from the chassis bottom.
7. Remove 1 (S1) screw from the chassis back..



### **13 Input PC Board Removal**

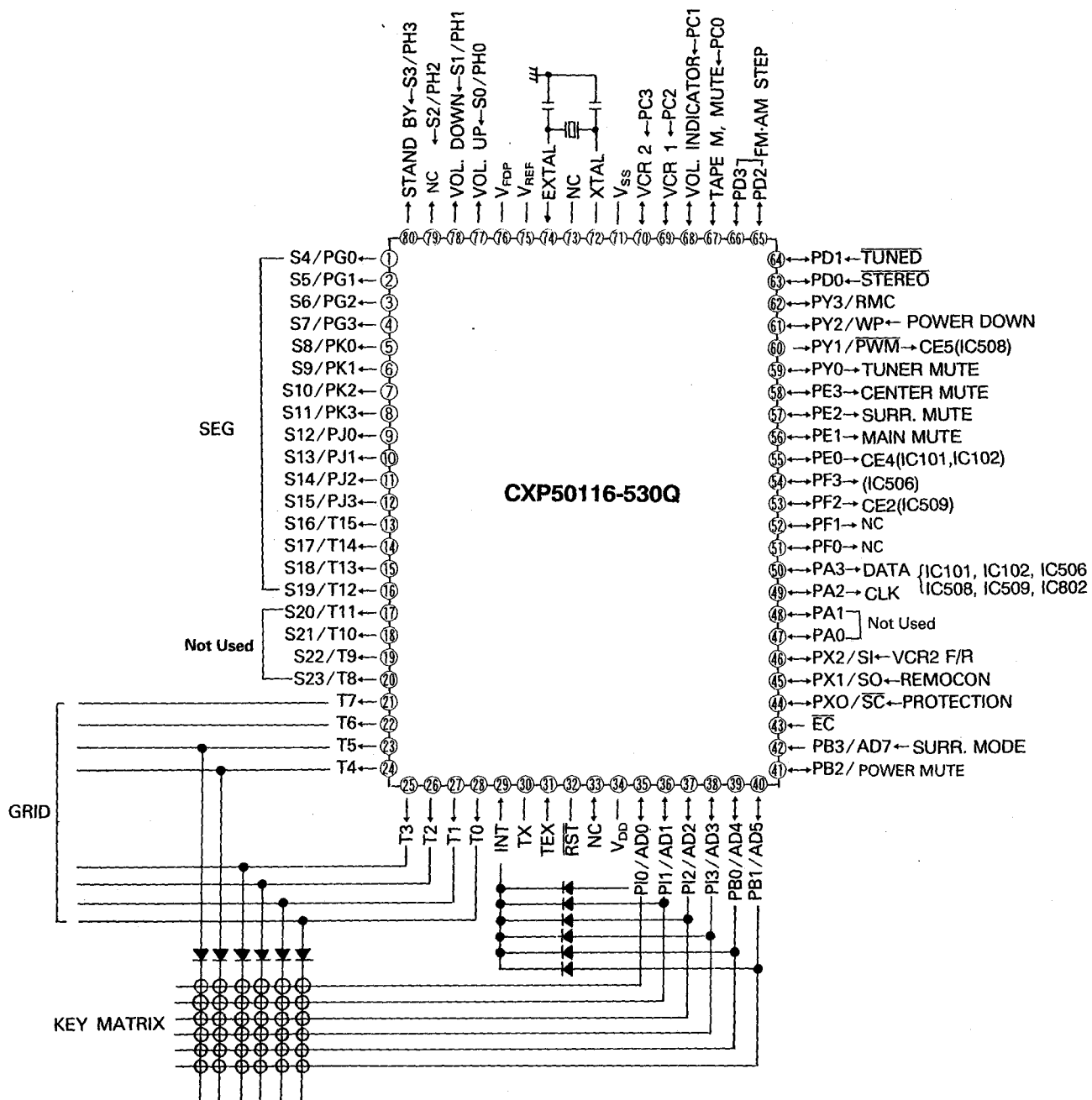
1. Remove the cover top.
2. Remove the panel front assembly.
3. Remove the chassis back.
4. Unsolder all leads of Q116, Q112, Q115, Q123, Q126 and Q127 from copper track on the input PC Board.
5. Disconnect CP103, CP109 and CP206 (black) from main PC Board.
6. Disconnect CP110, CP204, CP207 from input PC Board.
7. Remove 2 screws (S1) from the chassis front.
8. Remove 2 screws (S4) from the chassis right.
9. Remove 1 screw (S1) for unjoin input PC Board and bracket heatsink.

### **14 Main PC Board Removal**

1. Remove the cover top.
2. Remove the panel front assembly.
3. Remove the chassis back.
4. Unsolder all leads of Q216L/R, Q217L/R and Q213L/R from copper track on the input P.C. Board.
5. Disconnect CP201, CP202, CP203, CP204, CP206 (yellow), CP207H and CP207T from main P.C. Board.
6. Remove 1 screw (S1) from the chassis front.
7. Remove 1 screw (S4) from the chassis left.
8. Remove 1 screw (S1) for unjoin main P C Board and bracket heatsink.

## CIRCUIT DESCRIPTION

CPU (4 bit CMOS MICROPROCESSOR : CXP50116-530Q)

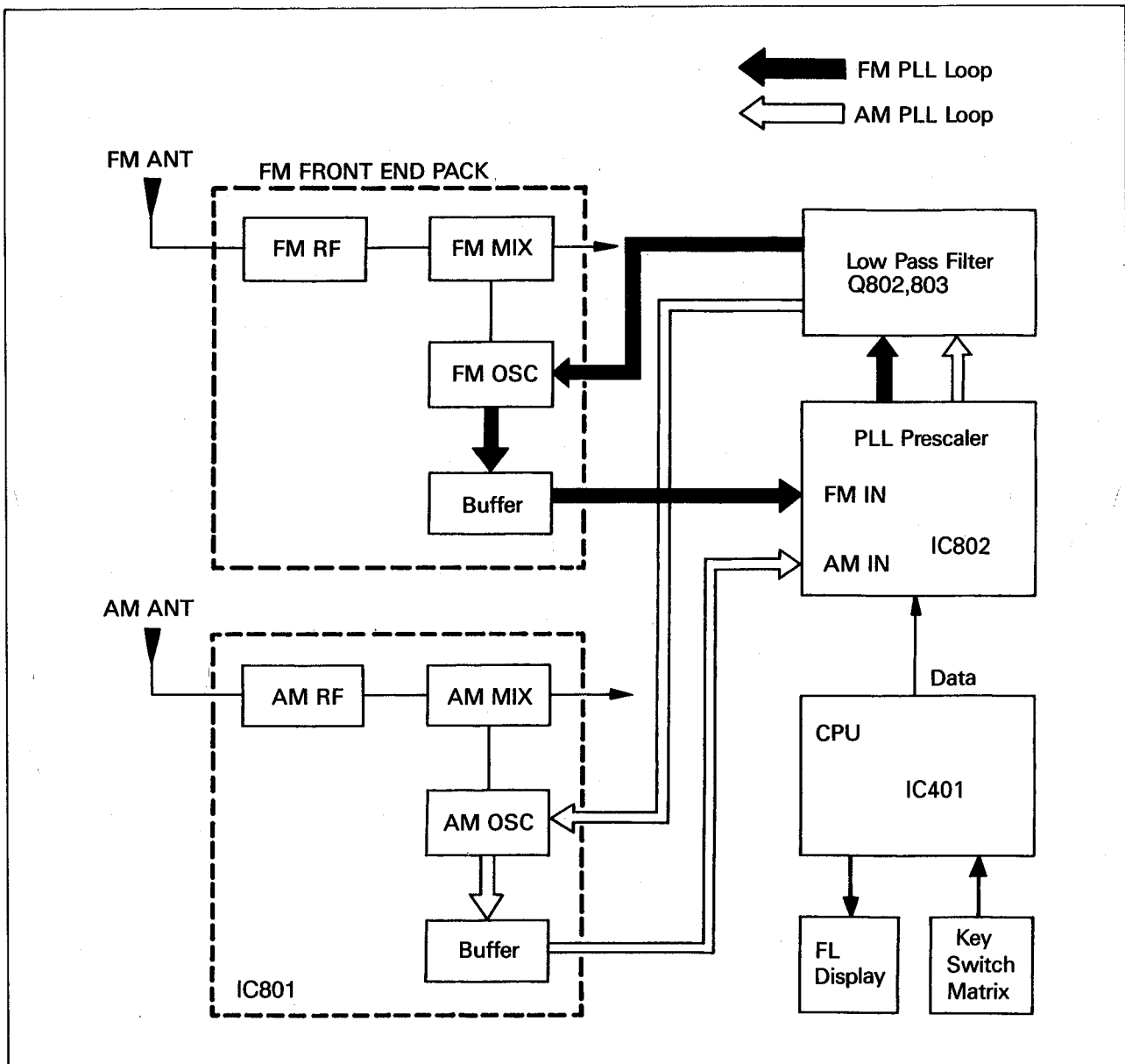


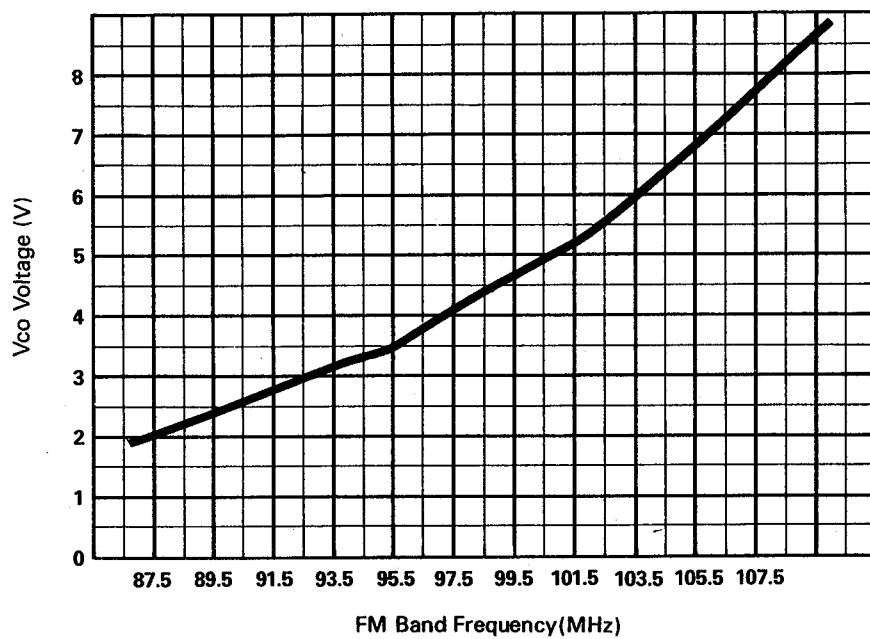
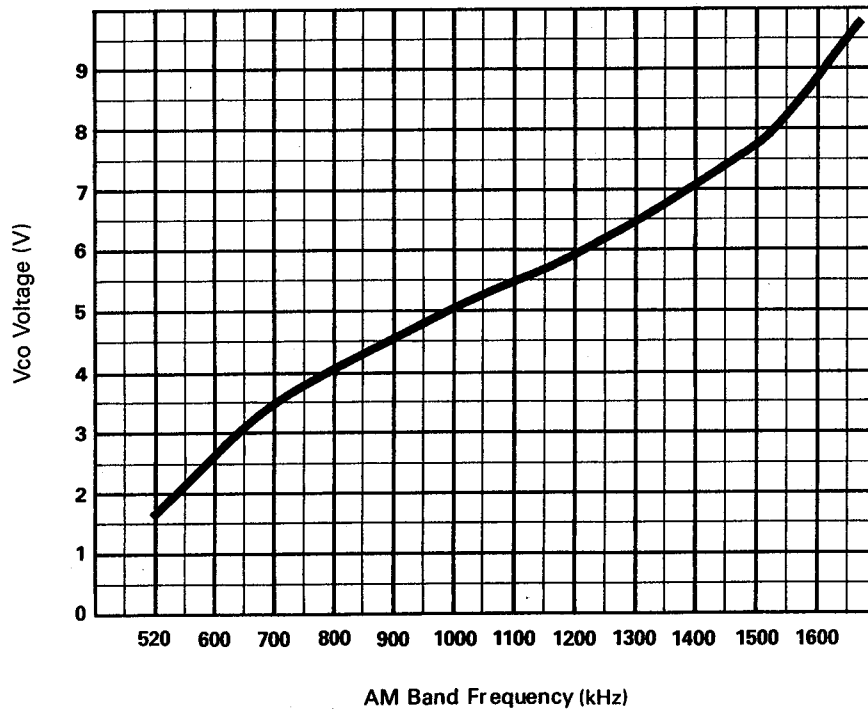
## INPUT AND OUTPUT TERMINAL FUNCTIONS

Code	Function
S4/PG0-S19/T12	These are segment signal output pins of FL controller/driver.
S20/T1-S23/T8	Not used
T7-T 0	These are timing signal output pins of FL controller/driver and key scan pins.
INT	This is external interrupt dedicated pin.
TX, TEX	Not used
RST	This is the system reset of the device.
NC	No connection
V <sub>DD</sub>	This is the power supply pin.
PI0/AD0-PB1/AD5	These are the key input pins.
PB2/AD6	This is the power mute output pin.
PB3/AD7	This is the channel mode control pin of surround mode.
EC	Not used.
PX0	This is the protection input pin.
PX1	This is the remote control input pin.
PX2	This is the VCR2 front and rar input control pin.
PA0	Not used.
PA1	Not used.
PA2-PA3	These are used to control the PLL IC, analog switching IC. Shift register IC, volume IC, delay IC. (CLK, DATA)
PF0	This is the FM mode colntrol pin.
PF1	This is used to control the PLL IC.
PF2	This is used to control the shift register IC.
PF3	This is used to control the volume IC.
PE0	This is used to control at analog switching IC.
PE1	This is the main mute output pin.
PE2	This is the surround mute output pin.
PE3	This is the center mute output pin.
PY0	This is the tuner mute output in.
PY1	This is used to control the delay IC.
PY2	This is the power down pin.
PY3	Not used.
PD0	This is the tuner stereo input pin.
PD1	This is the tuner tuned input pin.
PD2-PD3	These are used to control FM and AM step.
PC0	This is used to eliminate the noise of the PLL IC in the Tape 2 Monitor mode.
PC1	This is used to control volume indicator.
PC2	This is used to control VCR1
PC3	This is used to control VCR2
V <sub>SS</sub>	This pin provides the ground potential.
XTAL, EXTAL	These pin serve for connecting a clock oscillator crystal.
NC	No connection.
V <sub>REF</sub>	Not used.
V <sub>FDP</sub>	This is the power supply pin of the FL controller.
PH0-PH1	These are used to control the motor volume.
PH2	Not used.
PH3	This is used to control stand-by mode.

## DIGITAL TUNING SYSTEM DESCRIPTION

## DIGITAL TUNING SYSTEM



**Vco vs. FM Band Frequency Curve****Vco vs. AM Band Frequency Curve**

## CONTROL KEY AND MODE SWITCH MATRIX

### Searching for station

#### Automatic Tuning

Press the AUTO SEARCH key for automatic tuning.

Pressing the TUNE  $\Delta$  or TUNE  $\nabla$  key causes automatic up or down searching for a station until a station is received.

#### Manual Tuning

By pressing the TUNE  $\Delta$  or TUNE  $\nabla$  key, the frequency is changed by a step. If the key is kept pressing scanning is continued until the key is released.

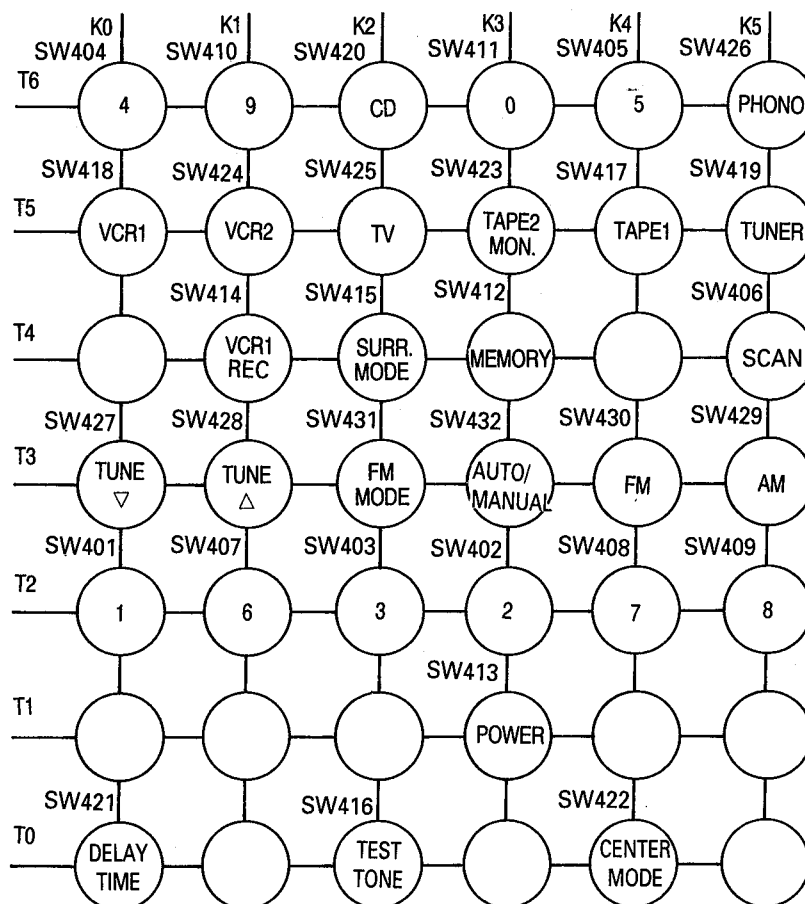
### Memory

The tuning information is stored into an internal RAM by pressing the MEMORY key and the pressing one of 30 preset locations while the memory indicator 'MEMORY' blinks.

If no key is pressed while the indicator blinks, the memory function is canceled.

### M1 to M10

Thirty AM and FM stations can be recalled from internal RAM. When It is switched from one band to the other band, the tuner tunes to the station last tuned on that band. Each time a station is changed, the controller provides a signal to mute the tuner.

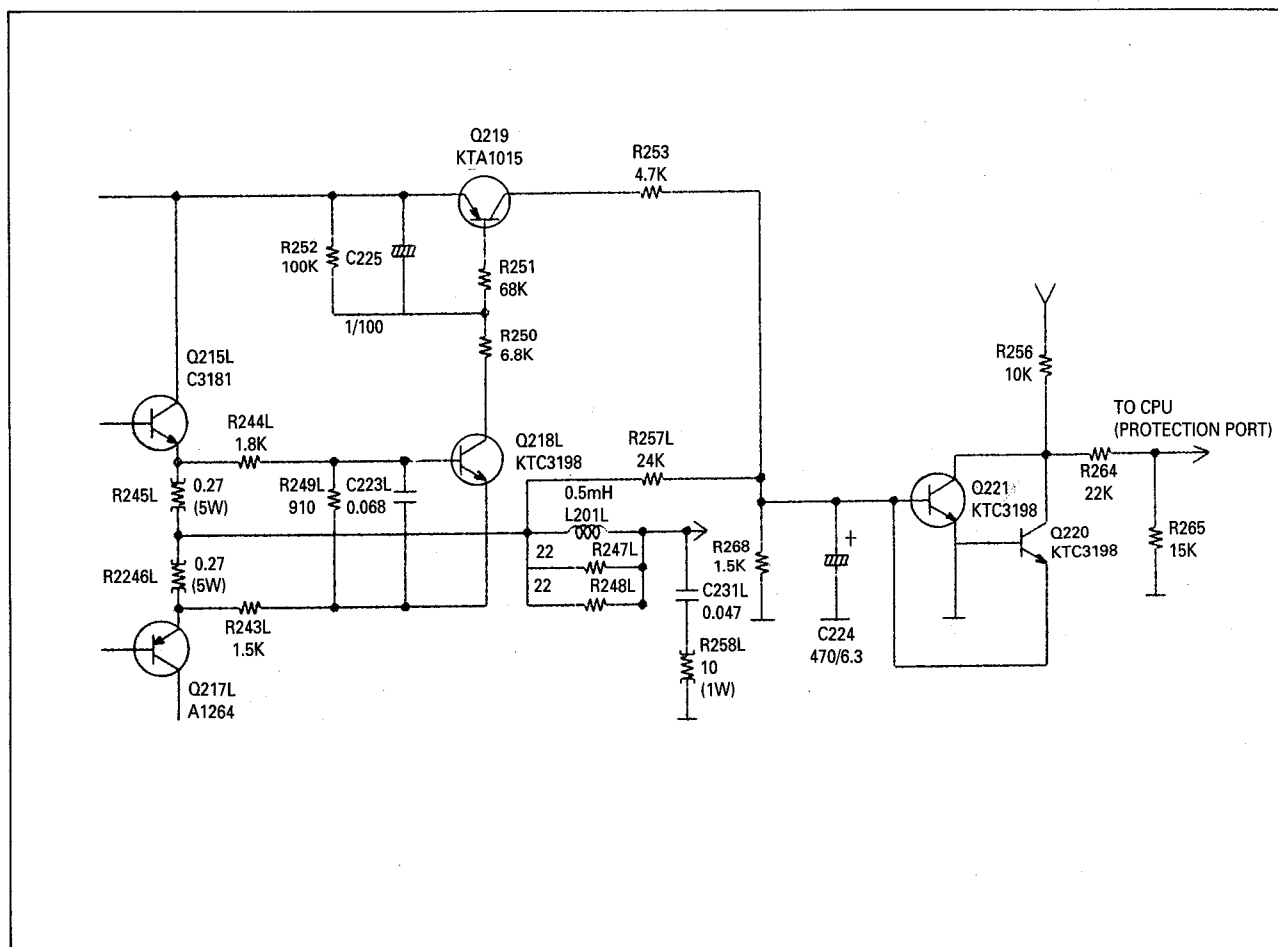


## PROTECTION CIRCUITS

### SPEAKER PROTECTION CIRCUIT

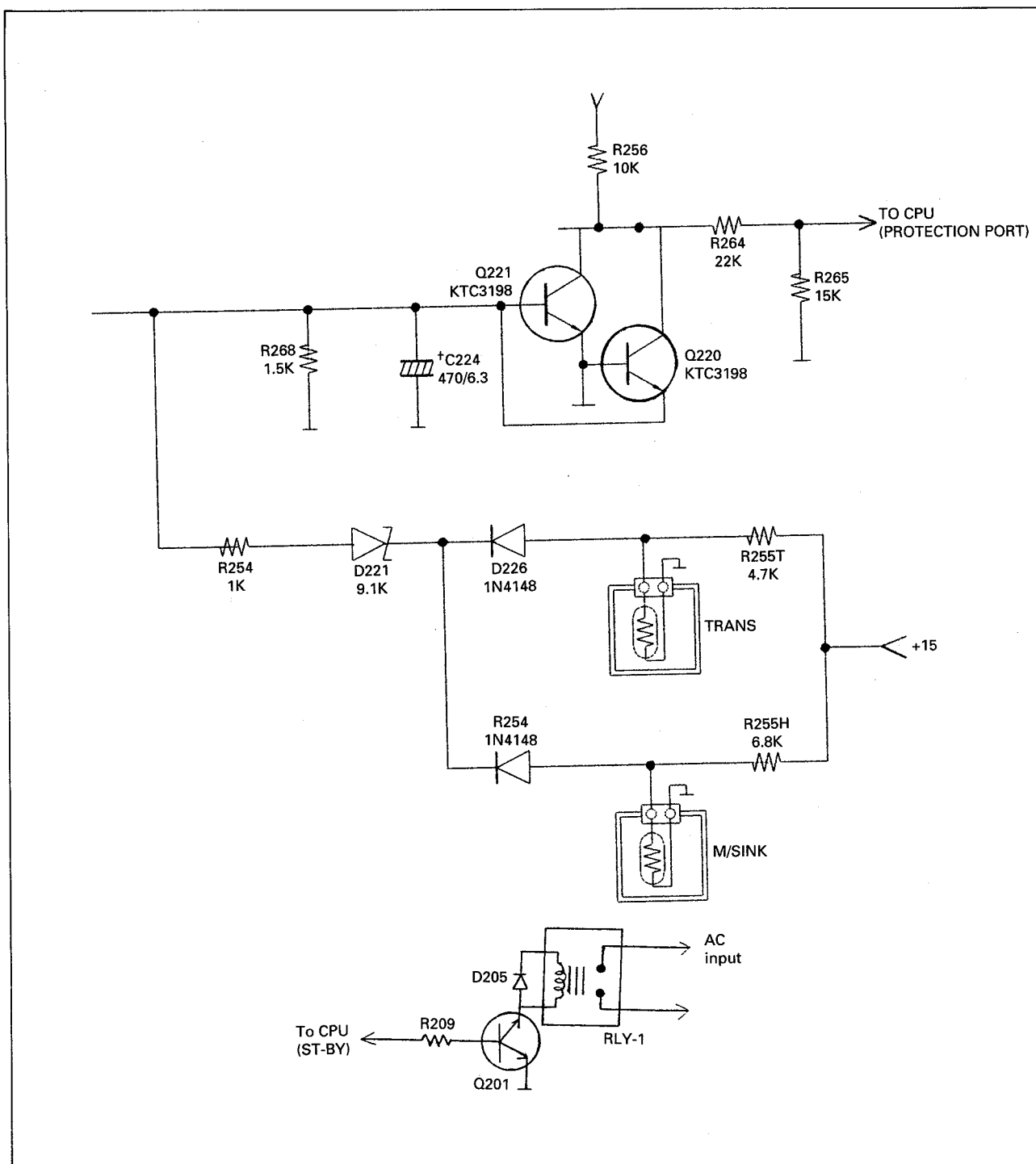
The CPU protects both this unit and the speakers when an abnormally high current flows in Q216 L/R and Q217 L/R due to excessive input drive, too low of a load impedance, or short of the speaker terminals. If current increase is excessive the voltage across R245 L/R or R246 L/R turns on Q218 L/R, then Q219 turns on Q221.

It makes the protection port of the CPU to low state, and the CPU turns off Q201 and RLY-1. Then the power is turned off.



## THERMAL PROTECTION CIRCUIT

This receiver has a overload thermal protection circuits to guard against abnormal operation. When the temperature of TRANS POSISTOR installed with the main transformer or H/SINK POSISTOR rises abnormally, the resistance of the posistor becomes larger and Q221 is turned on. It makes the protection port of the CPU to Low state, and the CPU turns off Q201 and RLY-1. Then the power is turned off.





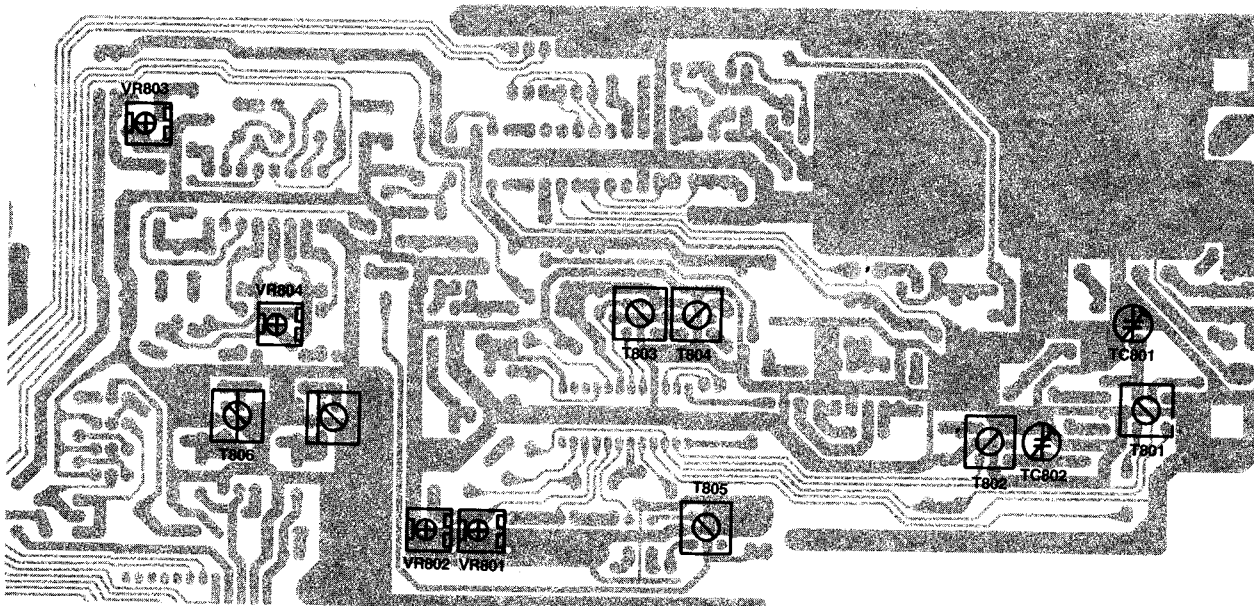
## ALIGNMENT PROCEDURES

### Equipment Required

- AM signal generator
- Oscilloscope
- AC voltmeter
- FM signal generator
- Stereo modulator
- Audio generator
- Distortion meter
- DC voltmeter
- Frequency counter

**Note:** Remove line cord antenna from FM external antenna terminal when aligning.

### Alignment and Test Points (Tuner P.C.Board)



### AM IF and RF Alignment

#### Preparation

1. Output of Signal Generator should not be higher than necessary to obtain an optimum output reading.
2. Signal Generator Modulation: 30%.
3. Switch: Press to AM.

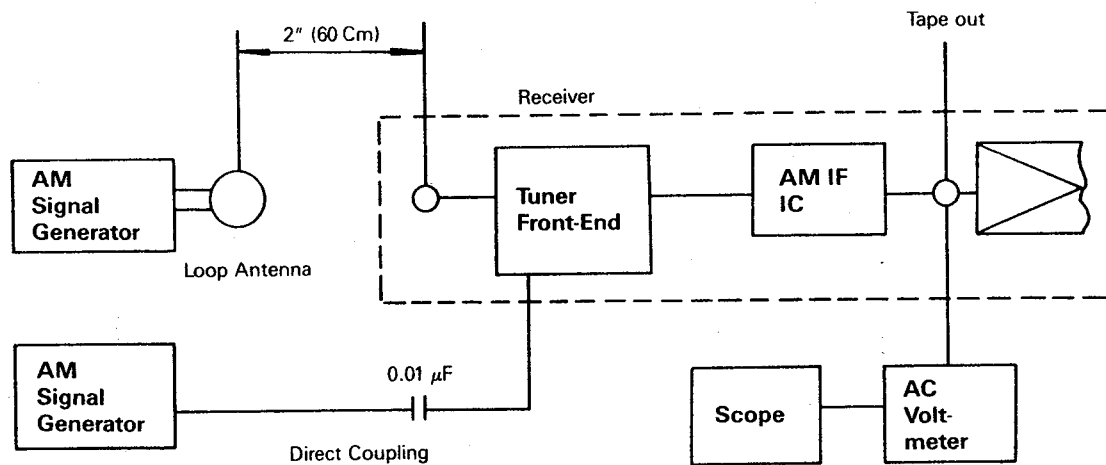
Step	Signal Generator Frequency	Receiver Frequency on the Display	Equipment Connection	Adjustment Point	Adjust for
1	450 kHz (400 Hz, Mod.)	Place at a non-interference spot around 600 kHz	AC voltmeter to TAPE OUT jack.	T805 (IFT)	Maximum reading
2	600 kHz (400 Hz, Mod.)	600 kHz	Same as Step 1.	T801 (ANT Coil)	Same as Step 1
3	1400 kHz (400 Hz, Mod.)	1400 kHz	Same as Step 1.	TC801 (ANT Trimmer)	Same as Step 1
4	1000 kHz (400 Hz, Mod.)	1000 kHz	FL display TUNED indicator	VR802	Indication on receiver with output of 500 $\mu$ V/m

## FM IF Alignment

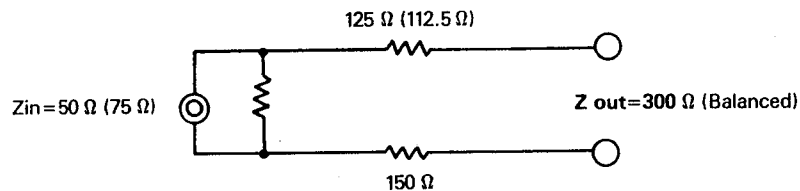
### Preparation

1. Signal Generator output should be no higher than necessary to obtain an optimum output reading.
2. Switch: Press to FM.
3. Signal generator deviation: 75 kHz.

Step	Signal Generator Frequency	Receiver Frequency Display	Equipment Connection	Adjustment Point	Adjust for
1	98.1 MHz (1 kHz, Mod.)	98.1 MHz	Distortion meter to TAPE OUT jack	T804	Minimum distortion
2	98.1 MHz (1 kHz, Mod.)	98.1 MHz	Same as Step 1	VR801	Zero reading on AC voltmeter with SSG output level of 6 $\mu$ V



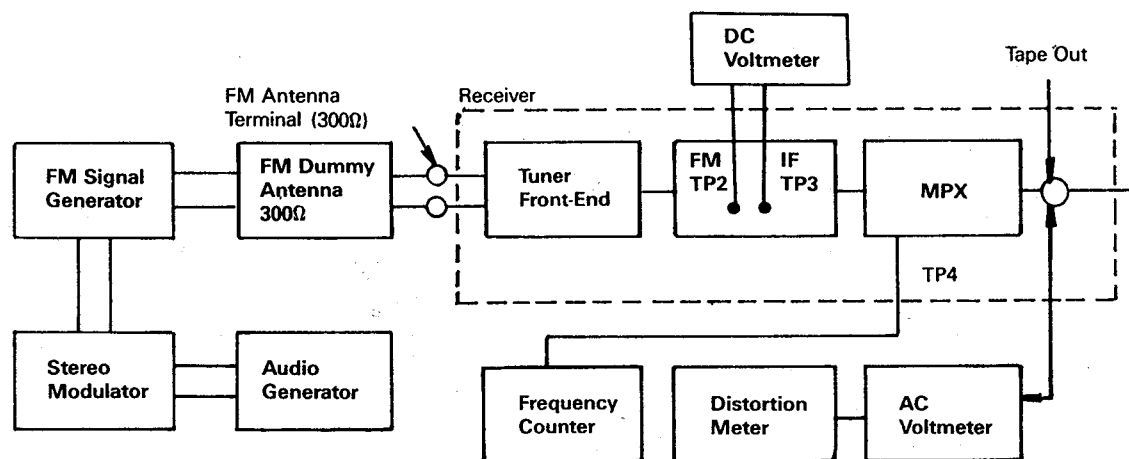
### AM Alignment Connection



FM Dummy Antenna to 300  $\Omega$  Antenna terminal of receiver

### FM Dummy Antenna

## MPX Alignment



FM RF/IF and MPX Alignment Connection

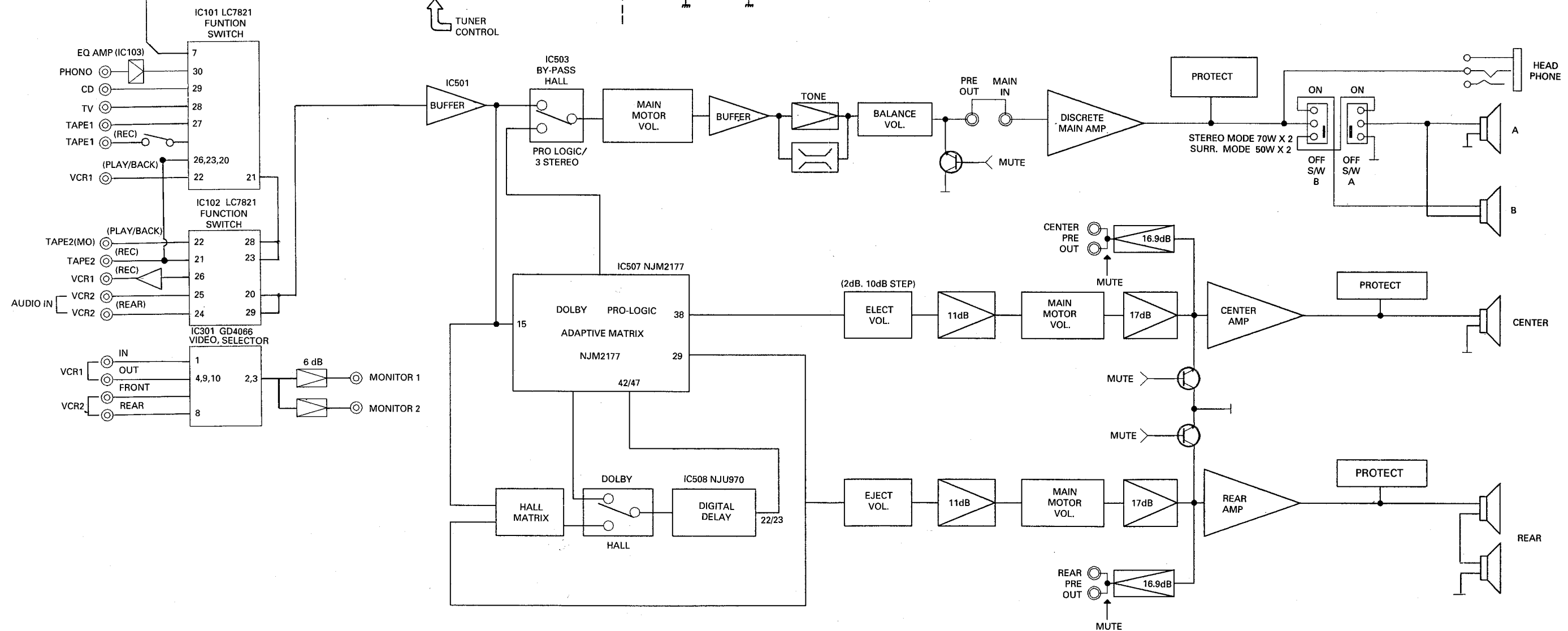
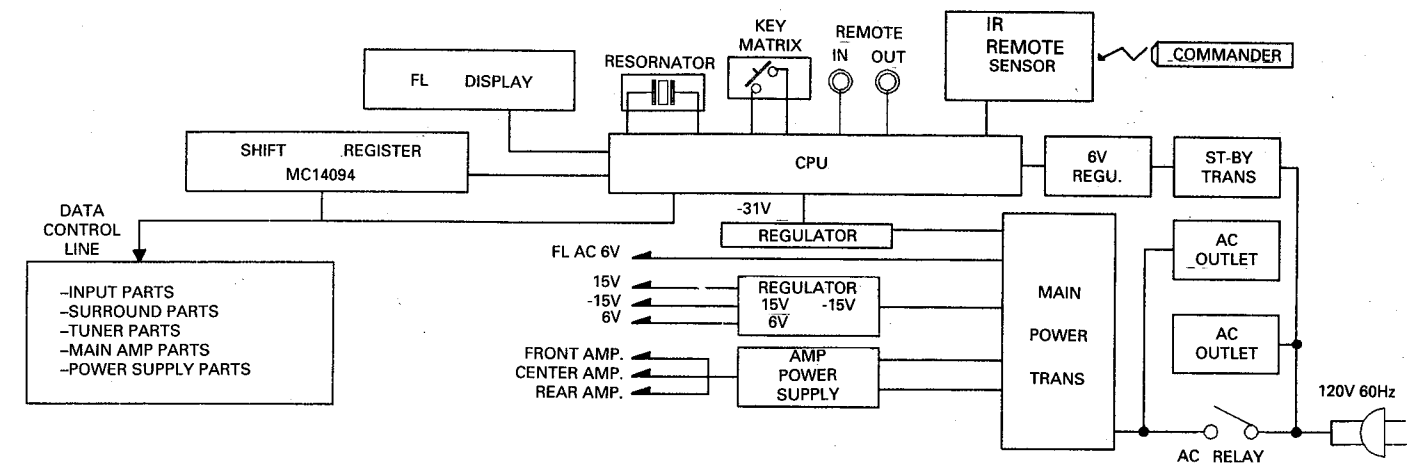
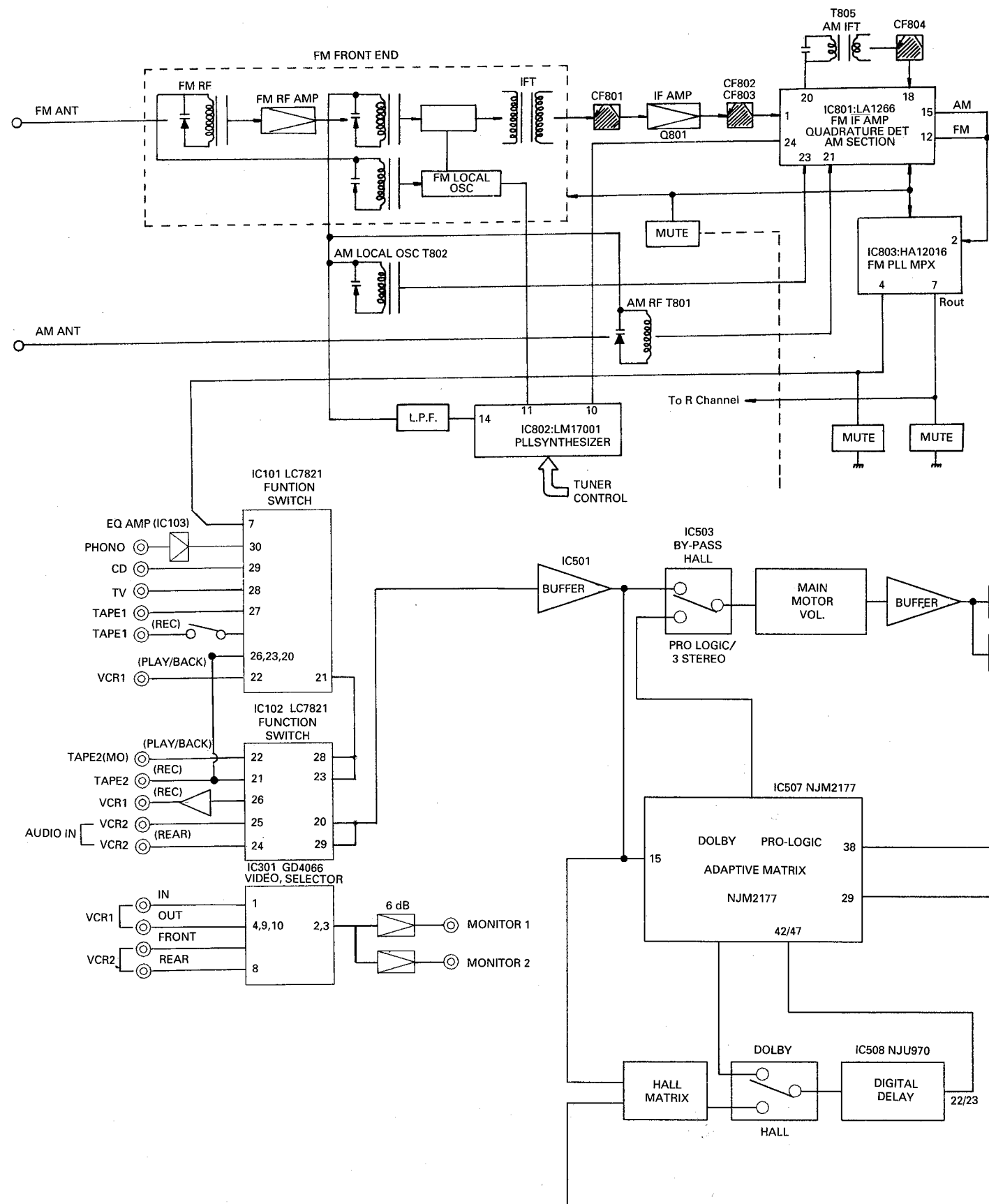
### Preparation

1. Switch: Press to FM.
2. Tune for 98 MHz on band.
3. Signal Generator output level: 1000  $\mu$ V.
4. Deviation: 75 kHz, at 100% modulation of composite signal.
5. Connect Signal Generator to FM antenna terminal through FM dummy antenna (300  $\Omega$ ).

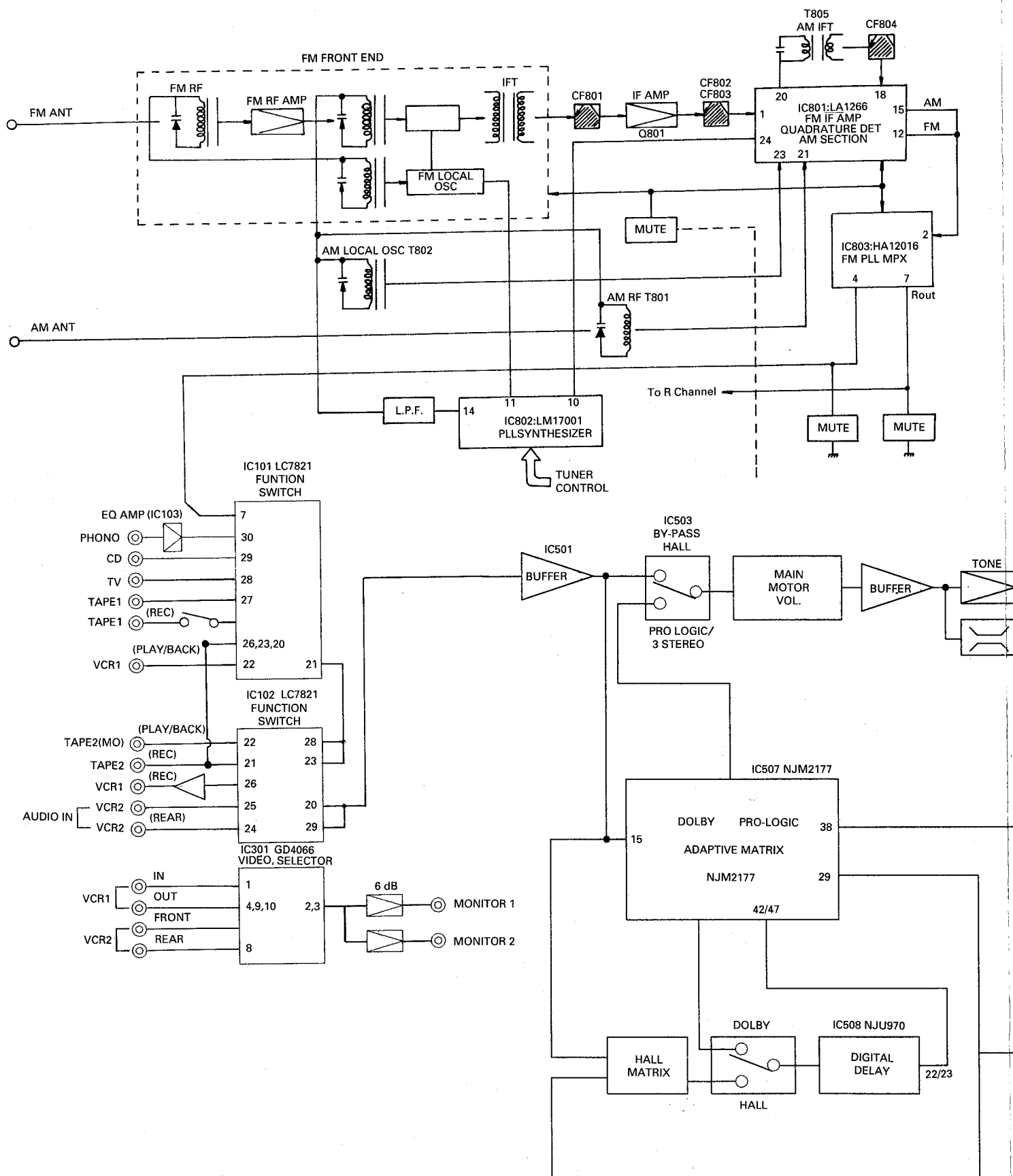
Step	19 kHz Modulation Level	Signal Generator Frequency Setting	Output Indicator Connection	Adjust	Adjust for
1	Pilot off	Carrier only	Frequency counter connect to TP4 (HOT) of PCB and ground	VR803	76kHz
2	8% mod.	Composite to channel 1kHz R	AC voltmeter to TAPE OUT jack of R channel	—	Adjust for about 450mV of audio output
3	8% mod.	Composite to channel 1kHz L	AC voltmeter to TAPE OUT jack of R channel	VR804	AC voltmeter reading should be at least 33dB below.
4	8% mod.	Composite to channel 1kHz R	AC voltmeter to TAPE OUT jack of L channel	VR804	Same as Step 3.

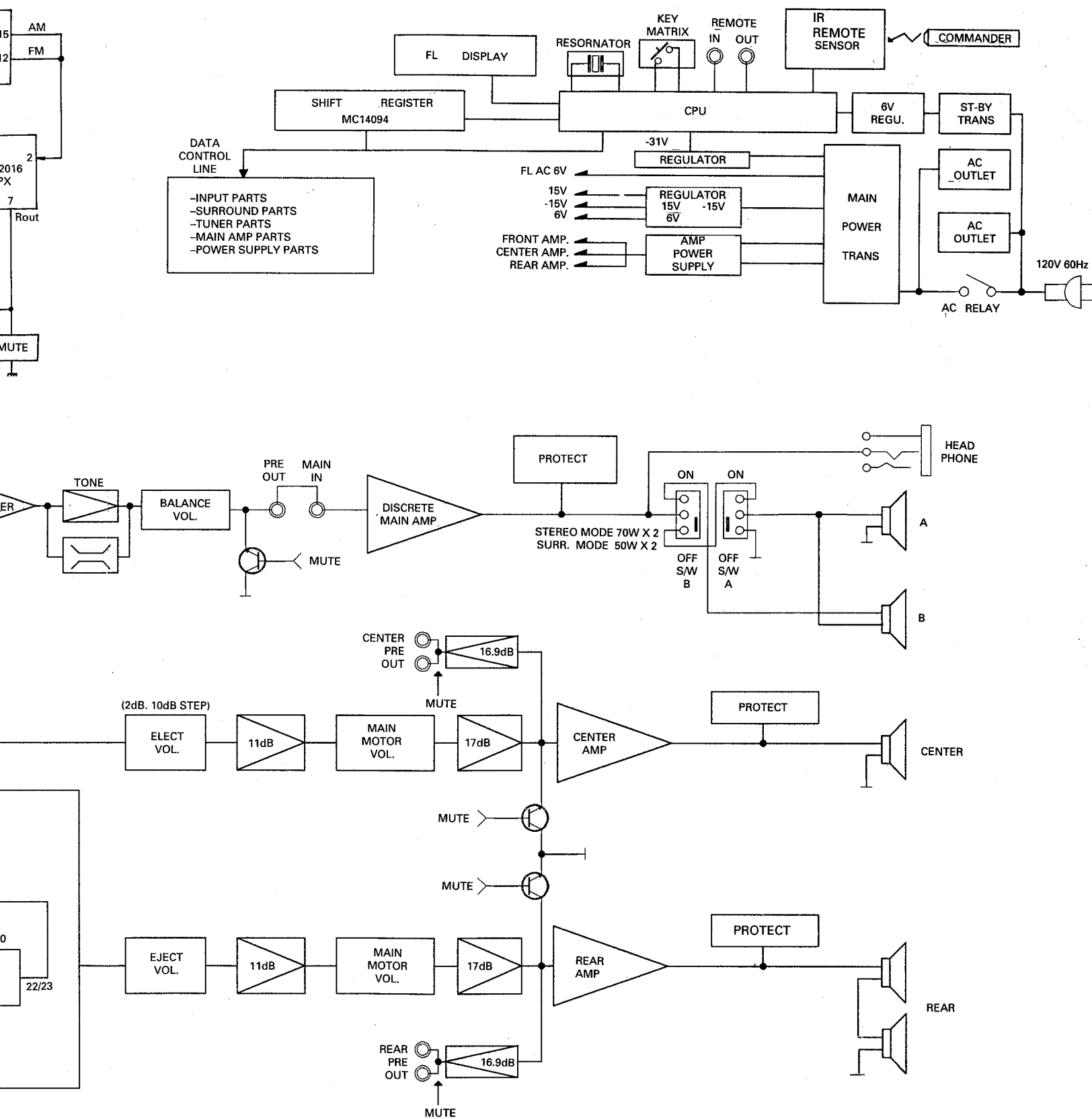
If you could not obtain -35 dB readings in Steps 3 and 4 (compared with Step 2), readjust VR804 until you obtain -33dB readings for both Steps 3 and 4. Nominal is -43dB.

# BLOCK DIAGRAM

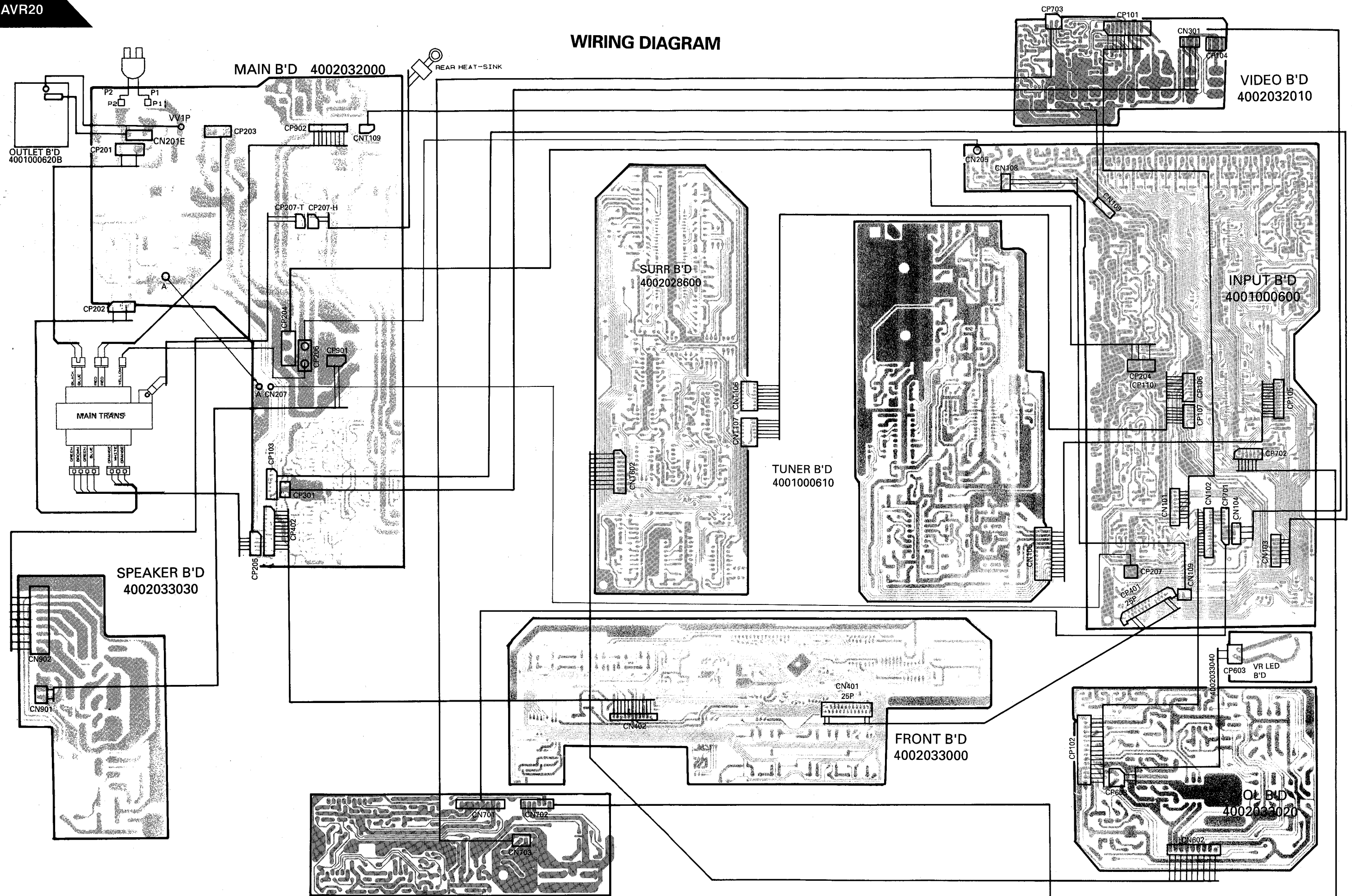


# BLOCK DIAGRAM

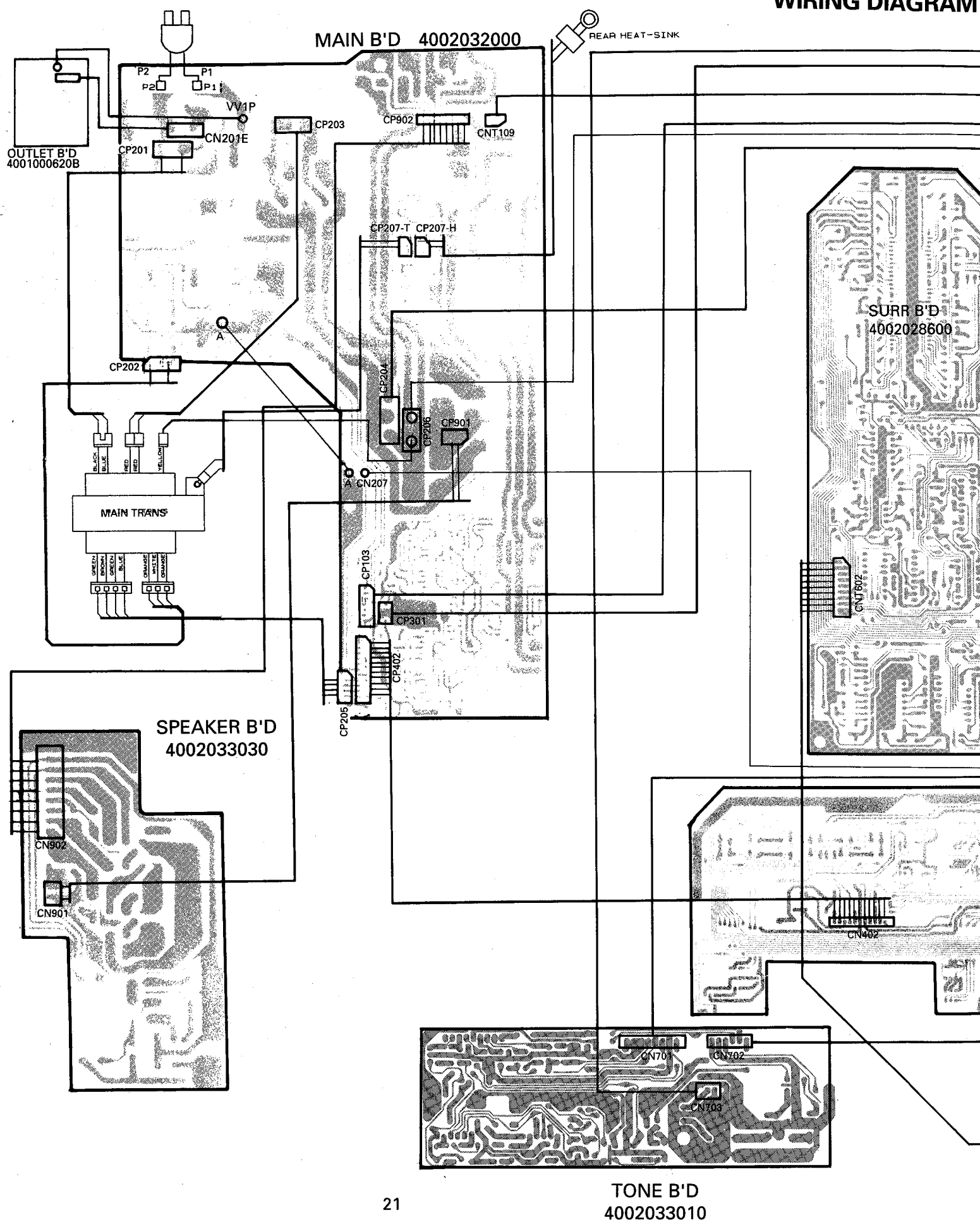




# WIRING DIAGRAM

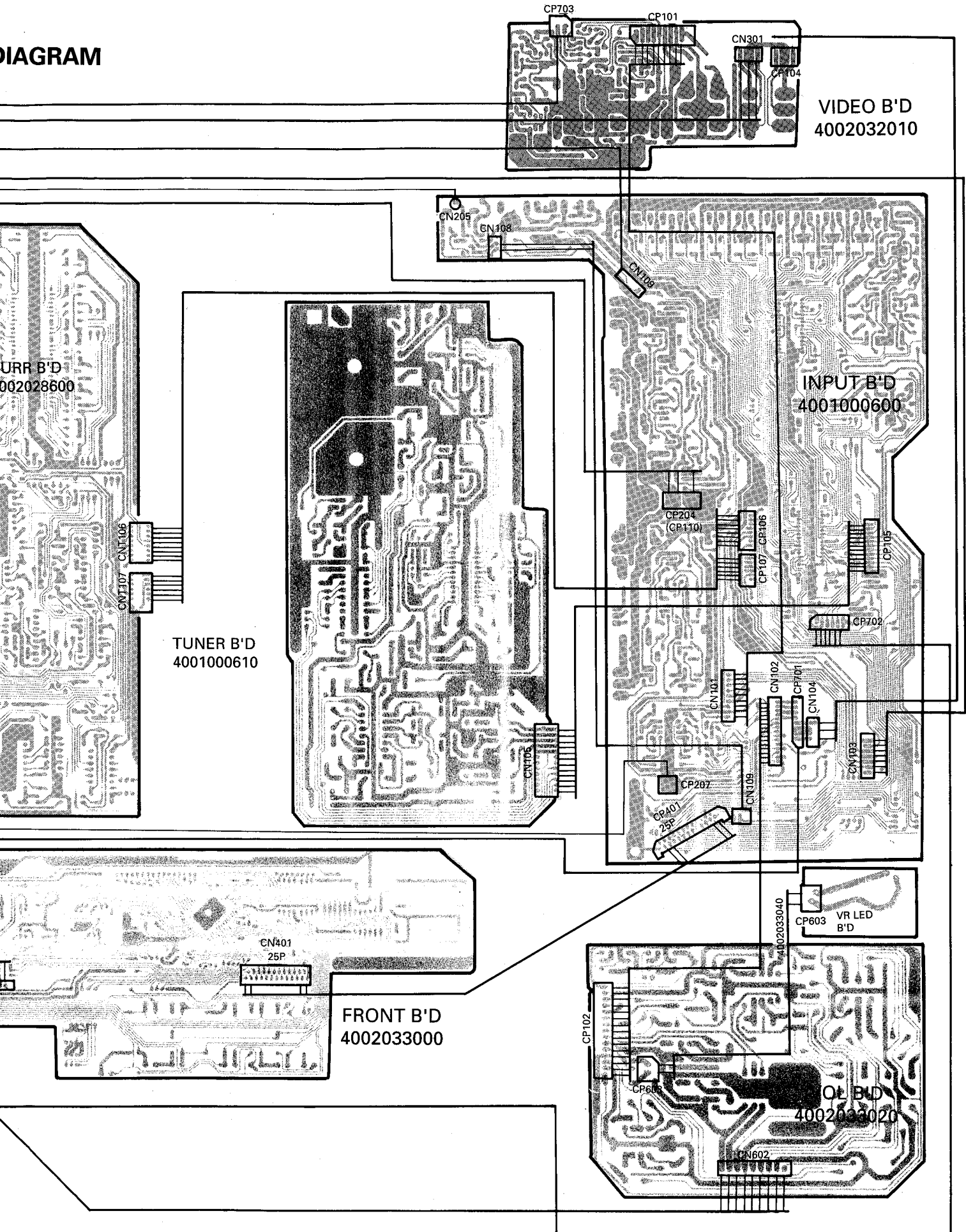


## WIRING DIAGRAM





# DIAGRAM



## TROUBLESHOOTING

Symptom	Cause and Remedy
Receiver inoperative (FL indicator does not light)	A) Faulty AC power cord. Replace. B) Defect the power switch. Replace. C) Broken wire in the power transformer. Replace the power transformer. D) Blown fuse. Replace the fuse.
Fuse blows when power is turned on.	A) Defective power transformer. Replace. B) Short the primary or secondary of the transformer circuitry. Repair the short. C) Damaged rectifier (D208 to D211) or damaged transistor (Q216 to Q217). Replace the defective component(s). D) Short circuit in the amplifier circuit. Repair the short.
Power indicator lights but no sound from both channels	A) Speaker switch 1 or 2 defective. Replace the defective switch (es) B) Defect in transistor Q216 L/R, Q217 L/R on the Main Amp Board. Replace the defective component(s).
Speaker A inoperative	A) Speaker switch A defective. Replace
Speaker B inoperative	A) Speaker switch B defective. Replace.
One channel does not work when Volume is at maximum with a test signal applied to the center terminal of Volume control VR5 of the dead channel	A) Defect in transistor Q216 L/R, Q217 L/R on the Main Amp Board Locate and correct the defect. B) Break in copper foil of printed circuit board. Repair the short. C) Short in speaker output terminal. Repair or replace.
Speaker works normally but headphones inoperative	A) Headphone plug does not mate with jack. Replace the plug. B) Defective resistor R901, R902. Replace.
PHONO input inoperative	A) Poor contact in phono input jack. Repair or replace the jack. B) Defective phono switch or IC103. Replace.
LOUDNESS has no effect	A) Defective loudness switch. Replace. B) Defective resistor R601, R602, C601, C602. Replace the defective components(s).
FM inoperative	A) Defective front-end. (FTH3-505H) Replace. B) Defective FM switch. Replace the switch

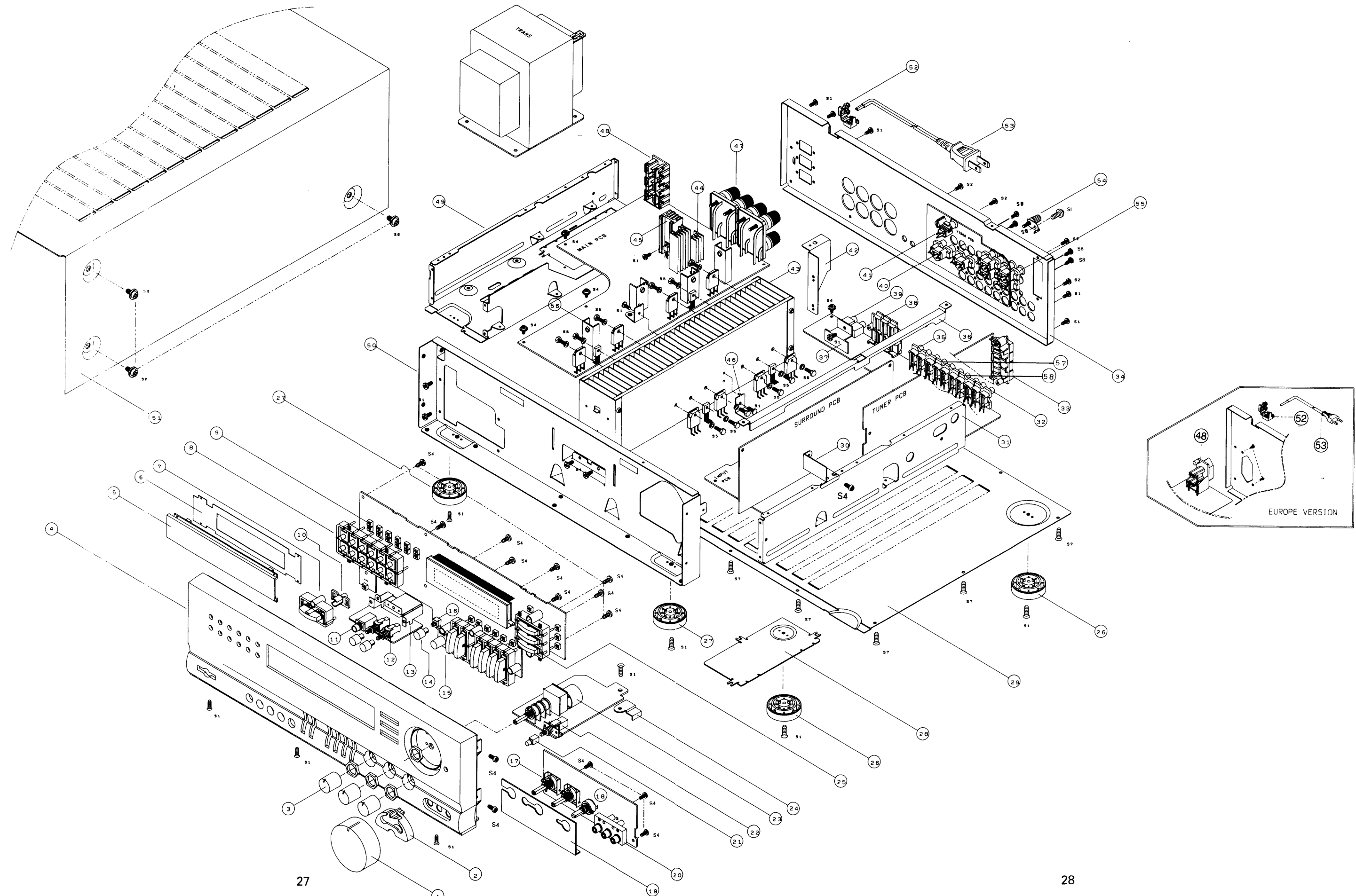
Symptom	Cause and Remedy
FM inoperative	<p>C) Defective transistor Q801, Q805, Q806, IC801, IC803 Replace the defective transistor(s) or IC(s).</p> <p>D) Defective coil T803 or T804 Replace the coil(s).</p> <p>E) Defective lead-in. Repair or replace the lead-in.</p> <p>F) Ceramic filter CF801, CF802, CF803 defective. Replace the defective ceramic filter(s).</p> <p>G) Defective controller circuit component. Replace.</p>
Poor multiplex separation	<p>A) Improper adjustment. Readjust VR803 and VR804. (Refer to MPX Alignment.)</p> <p>B) IC803 defective. Replace.</p> <p>C) Variable resistor VR803 or VR804 defective. Replace the variable resistor(s).</p>
STEREO indicator does not light	<p>A) Defective indicator in FL. Replace.</p> <p>B) Improper adjustment of VR803 of tuner board. Make readjustment.</p> <p>C) Defective IC803 Replace the defective component.</p>
FM volume not sufficient	<p>A) If volume from both L and R channels is not loud enough : Front end Section defective. Faulty IC801, Coil T803, Defective C838 of tuner Board. If sound of one channel is not loud enough: Defective T806, T807</p>
FM Mono has no effect	<p>A) Defective FM MODE switch. Replace.</p>
AM inoperative	<p>A) Damaged IC801 of tuner board. Replace.</p> <p>B) Defective T801, T802, T805 or CF804 of tuner board. Replace the defective component(s).</p> <p>C) Resistor R829, R817 defective. Replace the defective component(s).</p> <p>D) Capacitor C836, C818, C813 defective. Replace the defective capacitor(s).</p> <p>E) Defective AM switch Replace.</p> <p>F) Defective varicap diode VD1, VD2 Replace varicap diodes(s).</p> <p>G) Damaged AM loop antenna. Repair or replace.</p> <p>H) Defective controller circuit component. Replace.</p>
Bass control has no effect	<p>A) Variable resistor BASE defective. Replace.</p> <p>B) Defective R709L/R, R710L/R, C702L/R, C708L/R Replace the defective component(s).</p>

Symptom	Cause and Remedy
Treble control has no effect	A) Variable resistor TREBLE defective. B) Defective R711 L/R, R712 L/R, C709 L/R, C710L/R Replace the defective components(s).
Auto tune inoperative (UP/DOWN)	A) Poor contact in Up/Down key. Repair replace. B) Defective IC401 Replace. C) Defective FL401. Replace. D) Defective tuner circuit component. Replace. E) In case of FM only, improper adjustment of FM front-end. Readjust.
Manual tune inoperative (UP/DOWN) (AM or FM)	A) Poor contact in Up/Down key. Replace. B) Defective IC401. Replace.
Memory setting (keys 1-10) inoperative	A) Poor contact in memory keys 1-10. Replace. B) Poor contact in memory set key. Replace. C) Defective IC401. Replace the defective component.
FL inoperative	A) FL defective. Replace. B) Defective IC401. Replace. C) Defective X401. Replace.
Noise Volume control	A) Defective IC603. Replace. B) Defective capacitor C615 or C616. Replace the defective capacitor(s).
Remote Control Unit inoperative	A) Weak Battery. Replace. B) Defective. Replace. C) Defective IC401(CPU Board) or IC01. Replace.

## GENERAL UNIT PARTS LIST

Ref.No.	Mfr. Part No. Description	Version	Ref.No.	Mfr. Part No. Description	Version
1	048543059811 Knob, VR, ABS Black		46	6505134910 Bracket, PCB	
2	8555048610 Indicator, Volume		47	4408105810 Terminal, Speaker 8P	
3	048545124311 Knob, Rotary		48	4448102910 Outlet, AC, CCT1306-0212	USA/CA
4	048501033811 Panel, Front, ABS, Black		49	4448103610 Outlet, AC, YKE31-0090	Eur. Only
5	8553019710 Window, Display		50	6121608930 Frame (L)	
6	048555048511 Filter		51	6122214510 Chassis, Front, SECC ZN	
7	048545124011 Button, Power, ABS Black		52	046122022421 Cover, Top	USA/CA
8	048543059611 Button, Preset, ABS Black			6518002310 Stopper, Cord	Eur.
9 (SW401-432)	4658003710 Switch, Tact		53	6518002320 Stopper, Cord	USA/CA
10	8555048710 Indicator, Power			4408001410 Cord, AC Power	Eur.
11	4438005020 Jack, Phone		54	4408000430 Cord, AC Power	
12	462804310 Switch, Push, ABS Black		55	4408103710 System GND	
13	6165147910 Shield, Fence		56	4438103410 Jack, RCA, 4P, AP4-0096	
14	048545124111 Button, Speaker, ABS Black		57	7505210010 Heatsink, REG. TR	
15	048543059911 Button, Function, ABS Black		58	4438103110 Terminal, 4P	
16 (SW433)	4628054410 Switch, Push, 1 Key, ABS Black		P1	4438108010 Jack, RAC, 4P, with Ground	
17	3208049510 VR Bass/Treble		P1-1	4002032000B P.C. B Main	
18	320805210 VR, Balance		P2	4002032010B P.C. B Video	
19	6165148410 Shield, Fence, knob		P2-1	4002033000A P.C. B Front	
20	4438109710 Jack, RCA, 3P, VCR		P2-2	4002033010A P.C. B Tone	
21	048545124211 Button Loud, ABS Black		P2-3	4002033020A P.C. B Volume	
22	4628059610 Switch, Push, Loud		P2-4	4002033030A P.C. B Speaker	
23	3228019410 VR, Motor		P3	4002033040A P.C. B Volume/LED	
24	6505138410 Bracket, VR		P4	4002028600 P.C. B Surround	
25	048543059711 Button, Tuning, ABS Black		P4-1	4001000600B P.C. B Input	
26	6033102510 Foot, ABS, Black		P4-2	4001000610B P.C. B Tuner	
27	046033102511 Foot, Hot-stampinmg, Gold		P5	4001000620B P.C. B Outlet	
28	6123205210 Frame, Cover		S1	4008500200 P.C. B Commander	
29	6122418120 Cover Bottom, SECC		S2	8109230083 Screw #2BTC 3 x 8 (B)	
30	6506111710 Bracket, PCB		S3	8119130103 Screw #1PTC 3 x 10 (B)	
31	6122636410 Frame (R)		S4	8109230081 Screw #2BTC 3 x 8 (Y)	
32	4438108110 Jack, RAC, 4P		S5	8159230081 Screw #2WPTC 3 x 8 (Y)	
33	4408108310 Terminal, Antenna	USA/CA	S6	8099130121 Screw #HEX MSPW 3 x 12	
	4408108210 Terminal, Antenna	Eur.	S7	8159440083 Screw WSAM 4 x 8 (B)	
34	046102040611 Chassis, Back, SECC	USA/CA	S8	8109230063 Screw #2BTC 3 x 8 (B)	
	046102040611 Chassis, Back, SECC	Eur.		8155000710 Screw Ground	
35	4438103210 Jack, RCA, 6P			2828009981 Power Transformer, 120V, 60 Hz	USA/CA
36	6123205110 Frame, Center			2828009991 Power Transformer, 230V, 60 Hz	Eur.
37	6505138510 Bracket, Jack				
38	4408107410 Terminal, Speaker, 6P				
39	4438006510 Jack, Multi				
40	4438109310 Jack, RCA, 2P with Ground				
41	4438113810 Jack RCA, 1P, Yello				
42	6506135010 Bracket, Heatsink				
43	7502008510 Heatsink, Power				
44	7505206220 Heatsink, REG. TR				
45	7505206120 Heatsink, REG. TR				

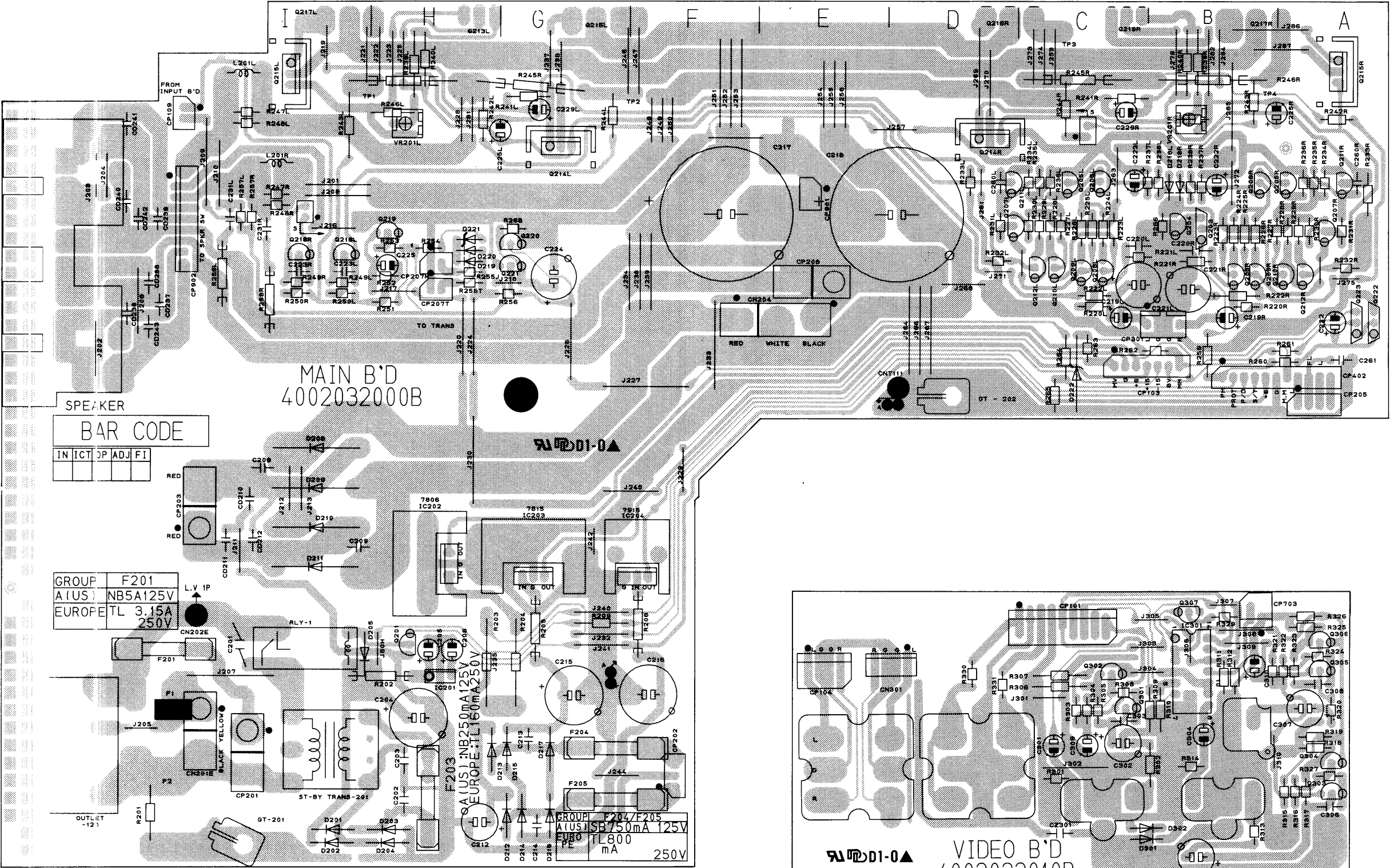
EXPLODED VIEW



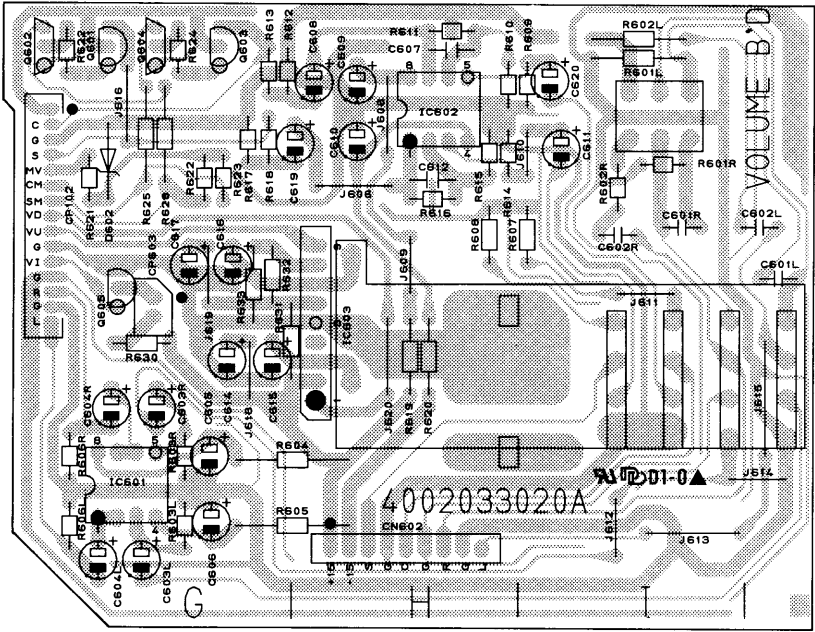
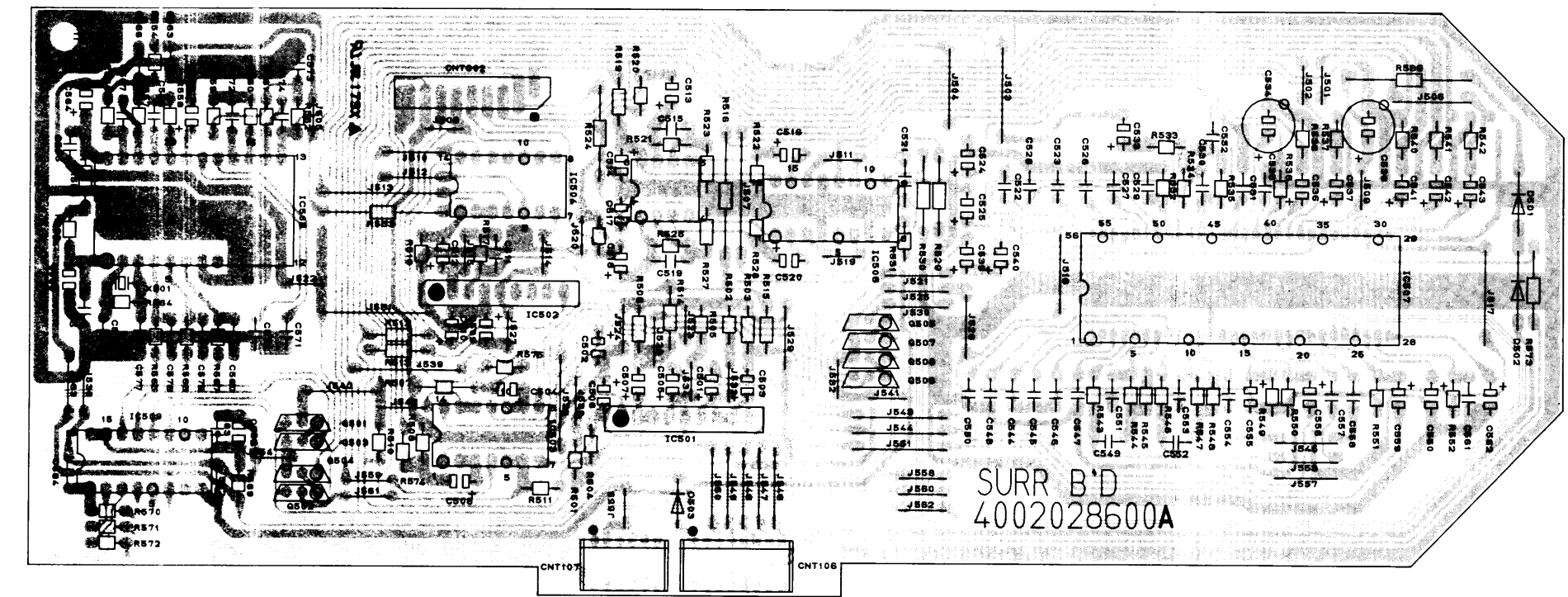
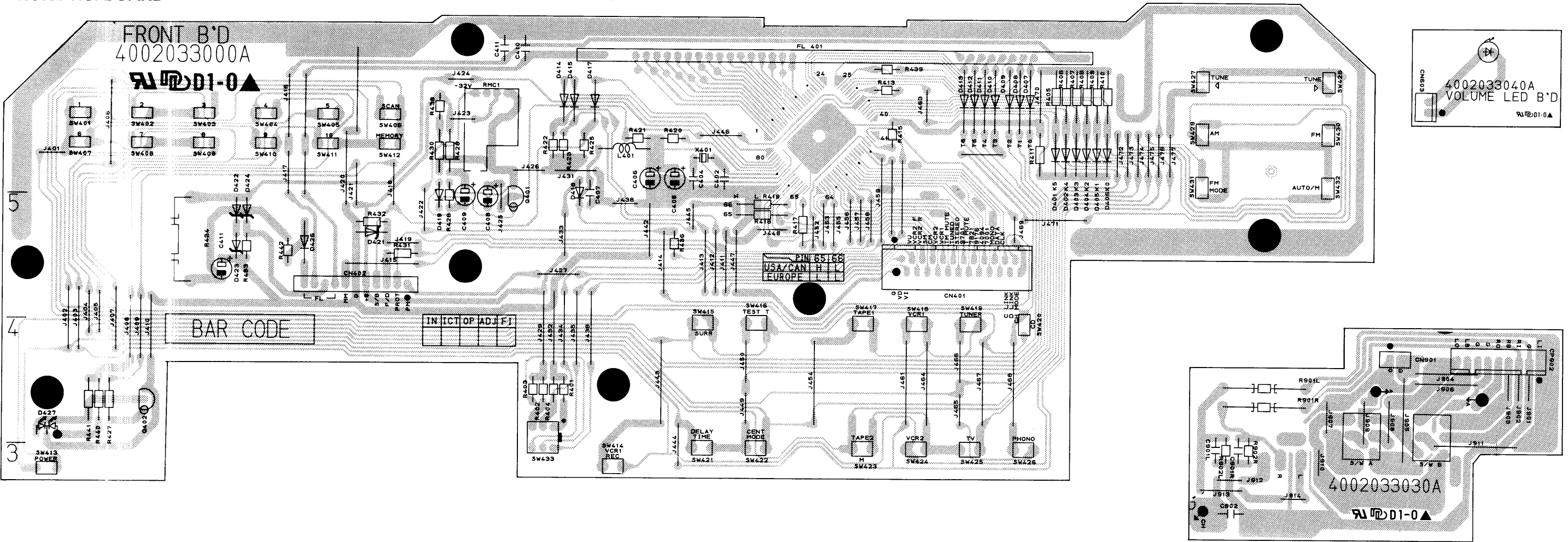


PRINTED CIRCUIT BOARDS

MAIN P.C. BOARD



FRONT P.C. BOARD







## ELECTRICAL PARTS LIST

Ref. No.	Mfr. Part No.	Description	Version	Ref. No.	Mfr. Part No.	Description	Version
	<b>057502000149</b>	<b>ASSEMBLY HEATSINK</b>		D222	2258599102	Zener, UZ 4.3 BSB	
42	6505135010	Bracket, Heatsink				<b>ICs</b>	
43	7502008510	Heatsink, Power		IC201/202	2168601110	GL7806	
46	6505134910	Bracket, PCB		IC203	2168601110	GL7815	
Q112	2008622110	2SC4137, Bias NPN		IC204	2168601111	GL7915	
Q115	2028407109	2SD7180/KTD718, NPN				<b>TRANSISTORS</b>	
Q116	2028107106	2SB688/KTB688, PNP		Q201	2208606104	KTC1815Y/BKTC3198Y, NPN	
Q123	2008622110	2SC4137, Bias NPN		Q203	2208622106	DTC114YS, NPN	
Q126	2028407109	2SD7180/KTD718, NPN		Q204L/R	2208206105	KTA1015Y/BKTA1266Y, PNP	
Q127	2028107106	2SB688/KTB688, PNP		Q205L/R	2208206104	KTA970/KTA1268	
Q213L/R	2008622110	2SC4137, Bias NPN		Q207L/R	2208606108	KTC2240/BKTC3200, NPN	
Q216L/R	2028307100	2SC3181N-O		Q208L/R	2208206104	KTA970/KTA1268	
Q217L/R	2028007100	2SA1264N-O		Q209L/R	2208206104	KTA970/KTA1268	
S1	8109230083	Screw #2BTC 3X8 (B)		Q210L/R	2208606108	KTC2240/BKTC3200, NPN	
S5	8099130121	Screw #HEX MSPW 3X12		Q211L/R	2208206102	BKTA949/KTA1024, PNP	
		<b>END OF ASSEMBLY HEATSINK</b>		Q212L/R	2208606107	KTC2229/KTC3206, NPN	
<b>P1</b>	<b>054002007504</b>	<b>ASS'Y P.C.B MAIN FOR USA/CA</b>		Q214L/R	2008602102	KSC2690A-Y, NPN	
<b>P1</b>	<b>054002007951</b>	<b>ASS'Y P.C.B MAIN FOR EUROPE</b>		Q215L/R	2008202101	KSA1220A-Y, PNP	
		<b>CAPACITORS</b>		Q218L/R	2208606104	KTC1815Y/BKTC3198Y, NPN	
C201	3549472407	Ceramic Tubular	0.0047 uF 400 V K	Q219	2208206105	KTA1015Y/BKTA1266Y, PNP	
C202/203	3679473120	Mylar	0.047 uF 100 V J	Q220/221	2208606104	KTC1815Y/BKTC3198Y, NPN	
C204	3409347149	Electric SG	470 uF 25 V M	Q222/223	2208622106	DTC114YS, NPN	
C206	3479222071	Electrolytic SA	22 uF 50 V M			<b>RESISTORS</b>	
C208/209	3679104257	Mylar	0.1 uF 250 V J	R201	3009335373	Carbon Film	3.3 Mohm 1/2W J
C212	3479310161	Electric SG	100 uF 35 V M	R202	3029479472	Metal Film	4.7 ohm 1 W J
C213/214	3679473120	Mylar	0.047 uF 100 V J	R203/204	3029220572	Metal Film	22 ohm 2 W J
C215/216	3409310269	Electric SG	1000 uF 35 V M	R205	3029100472	Metal Film	10 ohm 1 W J
C217/218	3419582235	Electrolytic HM	8200 uF 63 V M	R206	3029479472	Metal Film	4.7 ohm 1 W J
C219L/R	3479347031	Electrolytic SA	47 uF 16 V M	R209	3069332970	Carbon Film	3.3 kohm 1/5W J
C220L/R	3479210171	Electrolytic SA	100 uF 50 V J	R220L/R	3069331970	Carbon Film	330 ohm 1/5W J
C221L/R	3479347111	Electric SG	470 uF 6.3 V M	R221L/R	3069333970	Carbon Film	33 kohm 1/5W J
C222	3479210071	Electrolytic SA	10 uF 50 V M	R222L/R	3069102970	Carbon Film	1 kohm 1/5W J
C222L/R	3479210971	Electrolytic SA	1 uF 50 V M	R223L/R	3069152970	Carbon Film	1.5 kohm 1/5W J
C223L/R	3679683120	Mylar	0.068 uF 100 V J	R224L/R	3069391970	Carbon Film	390 ohm 1/5W J
C224	3479347111	Electric SG	470 uF 6.3 V M	R225L/R	3069152970	Carbon Film	1.5 kohm 1/5W J
C225	3479210071	Electrolytic SA	10 uF 50 V M	R226L/R	3069391970	Carbon Film	390 ohm 1/5W J
C225L/R	3479210071	Electrolytic SA	10 uF 50 V M	R227L/R	3069561970	Carbon Film	560 ohm 1/5W J
C229L/R	3479247971	Electrolytic SA	4.7 uF 50 V M	R228L/R	3069561970	Carbon Film	560 ohm 1/5W J
C231L/R	3679473120	Mylar	0.047 uF 100 V J	R229L/R	3069820970	Carbon Film	82 ohm 1/5W J
C260L/R	3579309030	Ceramic Disc	5 pF 50 V K	R230L/R	3069561970	Carbon Film	560 ohm 1/5W J
CD237-239	3519222935	Ceramic Tubular	0.0022 uF 50 V K Eur.	R231L/R	3069561970	Carbon Film	560 ohm 1/5W J
CD242	3519222935	Ceramic Tubular	0.0022 uF 50 V K Eur.	R232L/R	3069223970	Carbon Film	22 kohm 1/5W J
		<b>CONNECTORS</b>		R233L/R	3069223970	Carbon Film	22 kohm 1/5W J
CN204	4358800353	Lead Ass'y 3P 530mm		R234L/R	3069820970	Carbon Film	82 ohm 1/5W J
CN301	436204608331	Lead Ass'y 4P, Shield, 600 mm		R235L/R	3069561970	Carbon Film	560 ohm 1/5W J
CP103	4428505410	Wafer 7P		R236L/R	3069271970	Carbon Film	270 ohm 1/5W J
CP104	4428513440	Wafer 4P, Angle		R237L/R	3069103970	Carbon Film	10 kohm 1/5W J
CP109	4428508210	Wafer 2P		R238L/R	3069333970	Carbon Film	33 kohm 1/5W J
CP201	4428525780	Wafer 2P, AC		R239L/R	3069360970	Carbon Film	360 ohm 1/5W J
CP202	4428505710	Wafer 3P		R240L/R	3069122970	Carbon Film	1.2 kohm 1/5W J
CP203	4428525780	Wafer 2P, AC		R241L/R	3069820970	Carbon Film	82 ohm 1/5W J
CP205	4428505610	Wafer 4P		R242L/R	3069333970	Carbon Film	33 kohm 1/5W J
CP206	4428525780	Wafer 2P, AC		R243L/R	3069152970	Carbon Film	1.5 kohm 1/5W J
CP207H	4428508210	Wafer 2P		R244L/R	3069182970	Carbon Film	1.8 kohm 1/5W J
CP207T	4428508210	Wafer 2P		R245L/R	3059278782	Cement	0.27 ohm 5 W K
CP301	4428517710	Wafer 4P		R246L/R	3059278782	Cement	0.27 ohm 5 W K
CP402	4428510710	Wafer 11P		R247L/R	3069220970	Carbon Film	22 ohm 1/5W J
CP901	4428508210	Wafer 2P		R248L/R	3069220970	Carbon Film	22 ohm 1/5W J
CP902	4428518210	Wafer 9P		R249L/R	3069911970	Carbon Film	910 ohm 1/5W J
		<b>DIODES</b>		R250L/R	3069682970	Carbon Film	6.8 kohm 1/5W J
D201-205	2258100135	1N4002, Rectifier		R251L/R	3069683970	Carbon Film	68 kohm 1/5W J
D207	2258100135	1N4002, Rectifier		R252L/R	3069104970	Carbon Film	100 kohm 1/5W J
D208-211	2058100138	PX6A03, Rectifier		R253L/R	3069332970	Carbon Film	3.3 kohm 1/5W J
D212-217	2258100135	1N4002, Rectifier		R254L/R	3069102970	Carbon Film	1 kohm 1/5W J
D218L/R	2058322101	1N4148M		R255T	3069682970	Carbon Film	6.8 kohm 1/5W J
D219/220	2058322101	1N4148M		R256	3069103970	Carbon Film	10 kohm 1/5W J
D221	2258599107	Zener, UZ 9.1 BSC		R257L/R	3069243970	Carbon Film	24 kohm 1/5W J
				R258L/R	3029100472	Metal Film	10 ohm 1 W J

Ref. No.	Mfr. Part No.	Description	Version	Ref. No.	Mfr. Part No.	Description	Version
R259	3069103970	Carbon Film	10 kohm 1/5W J	R306	3069151970	Carbon Film	150 ohm 1/5W J
R260	3069103970	Carbon Film	10 kohm 1/5W J	R307	3069822970	Carbon Film	8.2 kohm 1/5W J
R261	3069103970	Carbon Film	10 kohm 1/5W J	R308	3069122970	Carbon Film	1.2 kohm 1/5W J
R262	3069102970	Carbon Film	1 kohm 1/5W J	R309-312	3069104970	Carbon Film	100 kohm 1/5W J
R263	3069242970	Carbon Film	2.4 kohm 1/5W J	R313/314	3069750970	Carbon Film	75 ohm 1/5W J
R264	3069223970	Carbon Film	22 kohm 1/5W J	R315	3069123970	Carbon Film	12 kohm 1/5W J
R265	3069153970	Carbon Film	15 kohm 1/5W J	R316	3069122970	Carbon Film	1.2 kohm 1/5W J
R266	3069154970	Carbon Film	150 kohm 1/5W J	R317	3069181970	Carbon Film	180 ohm 1/5W J
		<b>MISCELLANEOUS</b>		R318	3069151970	Carbon Film	150 ohm 1/5W J
44	7505206220	Heatsink, REG. TR		R319	3069822970	Carbon Film	8.2 kohm 1/5W J
45	7505206120	Heatsink, REG. TR		R320	3069750970	Carbon Film	75 ohm 1/5W J
47	4408105810	Terminal, Speaker 8P		R321	3069123970	Carbon Film	12 kohm 1/5W J
48	4448102910	Outlet, AC, CCT1306-0212	USA/CA	R322	3069122970	Carbon Film	1.2 kohm 1/5W J
56	7505210010	Heatsink, REG. TR		R323	3069181970	Carbon Film	180 ohm 1/5W J
J235/236	2648601470	Coil, 50 uH	Eur.	R324	3069122970	Carbon Film	1.2 kohm 1/5W J
L201/LR	2648001010	Inductor 0.5 uH		R325	3069151970	Carbon Film	150 ohm 1/5W J
F201	5508203021	Fuse, NB 125V 5A	USA/CA	R326	3069822970	Carbon Film	8.2 kohm 1/5W J
F201	5508302735	Fuse, 5T 3.15 A, 250 V, SEMKO	Eur.	R327	3069122970	Carbon Film	1.2 kohm 1/5W J
F203	5508201221	Fuse, NB 125V 250mA	USA/CA	R329	3069105970	Carbon Film	1 Mohm 1/5W J
F203	5508301034	Fuse, TL 160 mA, 250 V, SEMKO	Eur.	R330/331	3069471970	Carbon Film	470 ohm 1/5W J
F204/205	5508101821	Fuse, NB 125V 750mA	USA/CA			<b>MISCELLANEOUS</b>	
F204/205	5508301934	Fuse, TL 800 mA, 250 V, SEMKO	Eur.	40	4438109310	Jack, RCA, 2P with Ground	
GT201/202	4235007310	Ground Plate		41	4438113810	Jack RCA, 1P, Yellow	
RLY-1	5528001620	OEG OST-S-112DM, Relay		55	4438103410	Jack, RCA, 4P, AP4-0096	
S3	8109230081	Screw #2BTC 3X8 (Y)				<b>END OF ASS'Y P.C.B VIDEO</b>	
TRANS201	2828096001	Transformer, Standby					
VR201	3248322120	Semi, 220(B)					
		<b>END OF ASS'Y P.C.B MAIN</b>					
<b>P1-1</b>	<b>054002007506</b>	<b>ASS'Y P.C.B VIDEO</b>		<b>P2</b>	<b>054002007510</b>	<b>ASS'Y P.C.B FRONT</b>	
		<b>CAPACITORS</b>				<b>CAPACITORS</b>	
C301	3479233041	Electric SG	33 uF 25 V M	C402	3528560210	Ceramic CH	56 pF 50 V K
C302	3479347121	Electric SG	470 uF 10 V M	C404	3528560210	Ceramic CH	56 pF 50 V K
C303	3579471130	Ceramic Disc	470 pF 50 V K	C405	3409247022	Electric SS	47 uF 10 V M
C304	3479233041	Electric SG	33 uF 25 V M	C406	3449347314	Electrolytic, Backup	0.047 uF 5.5 V K
C305	3479347121	Electric SG	470 uF 10 V M	C407	3679104120	Mylar	0.1 uF 100 V J
C306	3519010935	Ceramic Tubular	1 pF 50 V K	C408	3479210971	Electrolytic SA	1 uF 50 V M
C307	3479347121	Electric SG	470 uF 10 V M	C409	3479210071	Electrolytic SA	10 uF 50 V M
C308	3519010935	Ceramic Tubular	1 pF 50 V K	C410	3679473120	Mylar	0.047 uF 100 V J
C309	3479310121	Electric SG	100 uF 10 V M	C411	3479310171	Electric SG	100 uF 50 V M
C311	3519104935	Ceramic Tubular	0.1 uF 50 V K	C411	3679473120	Mylar	0.047 uF 100 V J
C2301	3519104935	Ceramic Tubular	0.1 uF 50 V K			<b>CONNECTORS</b>	
		<b>CONNECTORS</b>		CN401	4428525826	Wafer 25P, 52575-2530	
CN301	436204608331	Lead Ass'y 4P		CN402	436111203331	Lead Ass'y 11P, 200 mm	
CP101	4428513490	Wafer 9P, Angle				<b>DIODES</b>	
CP104	4428513440	Wafer 4P, Angle		D401-415	2058322101	1N4148M	
CP703	4428513420	Wafer 2P, Angle		D417-419	2058322101	1N4148M	
		<b>DIODES</b>		D421	2258599102	Zener, UZ 4.3 BSB	
D301/302	2058322101	1N4148M		D422/423	2258599117	Zener, UZ 16.0 BSD	
		<b>IC</b>		D424	2258599107	Zener, UZ 9.1 BSC	
IC301	2138001101	GD4066, Switching		D426	2258100135	1N4002, Rectifier	
		<b>TRANSISTORS</b>		D427	2308222302	LED, SPR54MWW3, RED/GREEN	
Q301	2208206105	KTA1015Y/BKTA1266Y, PNP				<b>IC</b>	
Q302	2208606104	KTC1815Y/BKTC3198Y,NPN		IC401	2138322181	CPU, CXP50116-568Q	
Q303	2208206105	KTA1015Y/BKTA1266Y, PNP				<b>TRANSISTORS</b>	
Q304	2208606104	KTC1815Y/BKTC3198Y,NPN		Q401/402	2208606104	KTC1815Y/BKTC3198Y,NPN	
Q305	2208206105	KTA1015Y/BKTA1266Y, PNP				<b>RESISTORS</b>	
Q306	2208606104	KTC1815Y/BKTC3198Y,NPN		R401-403	3069103970	Carbon Film	10 kohm 1/5W J
Q307	2218207106	FET, 2SK117Y		R404	3069223970	Carbon Film	22 kohm 1/5W J
		<b>RESISTORS</b>		R405-410	3069473970	Carbon Film	47 kohm 1/5W J
R301/302	3069750970	Carbon Film	75 ohm 1/5W J	R411	3069224970	Carbon Film	220 kohm 1/5W J
R303	3069123970	Carbon Film	12 kohm 1/5W J	R413	3069334970	Carbon Film	330 kohm 1/5W J
R304	3069122970	Carbon Film	1.2 kohm 1/5W J	R415	3069103970	Carbon Film	10 kohm 1/5W J
R305	3069181970	Carbon Film	180 ohm 1/5W J	R417-420	3069103970	Carbon Film	10 kohm 1/5W J
				R421	3069104970	Carbon Film	100 kohm 1/5W J
				R422/423	3069473970	Carbon Film	47 kohm 1/5W J

Ref. No.	Mfr. Part No.	Description	Version	Ref. No.	Mfr. Part No.	Description	Version
R425	3069473970	Carbon Film	47 kohm 1/5W J				
R426	3069103970	Carbon Film	10 kohm 1/5W J				
R427	3069102970	Carbon Film	1 kohm 1/5W J				
R428	3069331970	Carbon Film	330 ohm 1/5W J				
R430	3069473970	Carbon Film	47 kohm 1/5W J				
R431/432	3069472970	Carbon Film	4.7 kohm 1/5W J				
R433	3069153970	Carbon Film	15 kohm 1/5W J				
R434	3029391472	Metal Film	390 ohm 1 W J				
R436	3069331970	Carbon Film	330 ohm 1/5W J				
R438	3069332970	Carbon Film	3.3 kohm 1/5W J				
R439	3069221970	Carbon Film	220 ohm 1/5W J				
R440	3069271970	Carbon Film	270 ohm 1/5W J				
R441	3069221970	Carbon Film	220 ohm 1/5W J				
R442	3069101970	Carbon Film	100 ohm 1/5W J				
		<b>MISCELLANEOUS</b>					
SW433	4628054410	Switch, Push, 1 Key, ABS Black					
SW401-432	4658003710	Switch, Tact					
FL401	2328130925	FIP 11CM9, FL Display					
L401	2648610182	Inductor 100 uH					
RMC1	2408005001	TFMT5380, 38 kHz, Remocon sensor					
X401	3938131460	Resonator, 4.19MHz					
	6715020730	Sponge, Rubber					
		<b>END OF ASS'Y P.C.B FRONT</b>					
<b>P2-1</b>	<b>054002007512</b>	<b>ASS'Y P.C.B TONE</b>					
		<b>CAPACITORS</b>					
C701L/R	3479210071	Electrolytic SA	10 uF 50 V M				
C702L/R	3519470935	Ceramic Tubular	47 pF 50 V K				
C703L/R	3479247971	Electrolytic SA	4.7 uF 50 V M				
C704/705	3479347041	Electric SG	47 uF 25 V M				
C706L/R	3479210071	Electrolytic SA	10 uF 50 V M				
C707L/R	3679183120	Mylar	0.018 uF 100 V J				
C708L/R	3679823120	Mylar	0.082 uF 100 V J				
C709L/R	3679392120	Mylar	0.0039 uF 100 V J				
C710L/R	3679183120	Mylar	0.018 uF 100 V J				
C711L/R	3529561935	Ceramic Tubular	560 pF 50 V K				
C712	3479333041	Electric SG	33 uF 25 V M				
C713L/R	3519101935	Ceramic Tubular	100 pF 50 V K				
C715/716	3479210871	Electrolytic SA	0.1 uF 50 V M				
		<b>CONNECTORS</b>					
CN701	436108203331	Lead Ass'y 200mm 8P					
CN702	436106223331	Lead Ass'y 220mm 6P					
CN703	436102483331	Lead Ass'y 2P, 480 mm					
		<b>IC</b>					
IC701	2168206103	KIA7559S/KIA4559S					
		<b>TRANSISTOR</b>					
Q701/702	2208606112	KTD1302, NPN					
Q703	2208206105	KTA1015Y/BKTA1266Y, PNP					
		<b>RESISTORS</b>					
R701L/R	3069102970	Carbon Film	1 kohm 1/5W J				
R702L/R	3069104970	Carbon Film	100 kohm 1/5W J				
R703L/R	3069224970	Carbon Film	220 kohm 1/5W J				
R704L/R	3069105970	Carbon Film	1 Mohm 1/5W J				
R705/706	3069470970	Carbon Film	47 ohm 1/5W J				
R707L/R	3069102970	Carbon Film	1 kohm 1/5W J				
R708L/R	3069104970	Carbon Film	100 kohm 1/5W J				
R709L/R	3069183970	Carbon Film	18 kohm 1/5W J				
R710L/R	3069392970	Carbon Film	3.9 kohm 1/5W J				
R711L/R	3069272970	Carbon Film	2.7 kohm 1/5W J				
R712L/R	3069751970	Carbon Film	750 ohm 1/5W J				
R713/714	3069102970	Carbon Film	1 kohm 1/5W J				
R715	3069103970	Carbon Film	10 kohm 1/5W J				
R716	3069471970	Carbon Film	470 ohm 1/5W J				
R717	3069750970	Carbon Film	75 ohm 1/5W J				
R718L/R	3069102970	Carbon Film	1 kohm 1/5W J				
		<b>MISCELLANEOUS</b>					
17	3208049510	VR Bass/Treble					
18	3208052010	VR, Balance					
20	4438109710	Jack, RCA, 3P, VCR					
	152624102857	LUG, HI-WP #24BK LF 280					
		<b>END OF ASS'Y P.C.B TONE</b>					
<b>P2-2</b>	<b>054002007508</b>	<b>ASS'Y P.C.B VOLUME</b>					
		<b>CAPACITORS</b>					
C601L/R	3479210871	Electrolytic SA	0.1 uF 50 V M				
C602L/R	3519681935	Ceramic Tubular	680 pF 50 V K				
C603L/R	3479247971	Electrolytic SA	4.7 uF 50 V M				
C604L/R	3479247971	Electrolytic SA	4.7 uF 50 V M				
C605/606	3479347041	Electric SG	47 uF 25 V M				
C607	3519102935	Ceramic Tubular	1000 pF 50 V K				
C608	3479210971	Electrolytic SA	1 uF 50 V M				
C609/610	3479347041	Electric SG	47 uF 25 V M				
C611	3479210971	Electric SG	1 uF 50 V M				
C612	3519102935	Ceramic Tubular	1000 pF 50 V K				
C614	3479210071	Electrolytic SA	10 uF 50 V M				
C615/616	3479310121	Electric SG	100 uF 16 V M				
C617	3479310131	Electric SG	100 uF 10 V M				
C619	3479210071	Electrolytic SA	10 uF 50 V M				
C620	3479210971	Electric SG	1 uF 50 V M				
		<b>CONNECTORS</b>					
CNT102	4428517410	Wafer 15P					
CNT602	436109183331	Lead Ass'y 180mm 9P					
CNT603	4428508210	Wafer 2P					
		<b>DIODES</b>					
D602	2258599102	Zener, UZ 4.3 BSB					
D701	2058322101	1N4148M					
D702	2058322101	1N4148M					
		<b>ICs</b>					
IC601/602	2168206104	KIA7559P/KIA4559P					
IC603	2168007204	TA7291S					
		<b>TRANSISTORS</b>					
Q601	2208606112	KTD1302, NPN					
Q602	2208222105	KTA114Y, PNP					
Q603	2208606112	KTD1302, NPN					
Q604	2208222105	KTA114Y, PNP					
Q605	2208622108	DTC114TS, NPN					
		<b>RESISTORS</b>					
R601L/R	3069512970	Carbon Film	5.1 kohm 1/5W J				
R602L/R	3069183970	Carbon Film	18 kohm 1/5W J				
R603L/R	3069104970	Carbon Film	100 kohm 1/5W J				
R604/605	3069101970	Carbon Film	100 ohm 1/5W J				
R606L/R	3069104970	Carbon Film	100 kohm 1/5W J				
R607/608	3069512970	Carbon Film	5.1 kohm 1/5W J				
R609	3069473970	Carbon Film	47 kohm 1/5W J				
R610	3069102970	Carbon Film	1 kohm 1/5W J				
R611	3069622970	Carbon Film	6.2 kohm 1/5W J				
R612	3069104970	Carbon Film	100 kohm 1/5W J				
R613	3069471970	Carbon Film	470 ohm 1/5W J				
R614	3069473970	Carbon Film	47 kohm 1/5W J				
R615	3069102970	Carbon Film	1 kohm 1/5W J				
R616	3069622970	Carbon Film	6.2 kohm 1/5W J				
R617	3069104970	Carbon Film	100 kohm 1/5W J				
R618	3069471970	Carbon Film	470 ohm 1/5W J				
R619/620	3069101970	Carbon Film	100 ohm 1/5W J				
R621	3069332970	Carbon Film	3.3 kohm 1/5W J				
R622-624	3069102970	Carbon Film	1 kohm 1/5W J				
R625-628	3069471970	Carbon Film	470 ohm 1/5W J				
R630	3069561970	Carbon Film	560 ohm 1/5W J				
R631	3069479970	Carbon Film	4.7 ohm 1/5W J				
R632	3069103970	Carbon Film	10 kohm 1/5W J				

Ref. No.	Mfr. Part No.	Description	Version	Ref. No.	Mfr. Part No.	Description	Version
R633	3069302970	Carbon Film	3 kohm 1/5W J	C149	3579150130	Ceramic Disc	15 pF 50 V K
		<b>MISCELLANEOUS</b>		C151	3579809030	Ceramic Disc	8 pF 50 V K
22	4628059610	Switch, Push, Loud		C152	3479332041	Electric SG	33 uF 25 V M
23	3228019410	VR, Motor		C153	3579102130	Ceramic Disc	1000 pF 50 V K
		<b>END OF ASS'Y P.C.B VOLUME</b>		C154	3579221130	Ceramic Disc	220 pF 50 V K
<b>P2-3</b>	<b>054002007522</b>	<b>ASS'Y P.C.B SPEAKER CONNECTORS</b>		C155	3679473120	Mylar	0.047 uF 100 V J
CN901	436102283321	Lead Ass'y, 2P, 280mm		C156	3479210971	Electrolytic SA	1 uF 50 V M
CN902	435209403401	Lead Ass'y, 9P, 400mm		C157	3579221130	Ceramic Disc	220 pF 50 V K
		<b>RESISTORS</b>		C158	3679473120	Mylar	0.047 uF 100 V J
R901L/R	3029271572	Metal Film	270 ohm 2 W J	C159	3479247871	Electrolytic SA	0.47 uF 50 V M
		<b>MISCELLANEOUS</b>		C160	3579681130	Ceramic Disc	680 pF 50 V K
	152622100607	LUG, HI-W AWG #22BK60		C161	3579471130	Ceramic Disc	470 pF 50 V K
11	4438005020	Jack, Phone		C162	3579270130	Ceramic Disc	27 pF 50 V K
12	4628043810	Switch, Push, ABS Black		C163	3479332041	Electric SG	33 uF 25 V M
13	6165147910	Shield, Fence		C164	3579809130	Ceramic Disc	8 pF 50 V K
		<b>END OF ASS'Y P.C.B SPEAKER</b>		C166	3579150130	Ceramic Disc	15 pF 50 V K
<b>P2-4</b>	<b>054002007514</b>	<b>ASS'Y P.C.B VOLUME LED</b>		C167	3579102130	Ceramic Disc	1000 pF 50 V K
CNT603	435102183181	Lead Ass'y 180mm 2P		C168/169	3579221130	Ceramic Disc	220 pF 50 V K
D601	2308220324	LED, SLC-22VR5		C170	3679473120	Mylar	0.047 uF 100 V J
		<b>END OF ASS'Y P.C.B VOLUME LED</b>		C171	3479210971	Electrolytic SA	1 uF 50 V M
				C172	3679473120	Mylar	0.047 uF 100 V J
				C173-175	3579472530	Ceramic Tubular	0.0047 uF 50 V K
				C176	3479347041	Electric SG	47 uF 25 V M
				C178	3479347041	Electric SG	47 uF 25 V M
				C187	3579104530	Ceramic Disc	0.1 uF 50 V K
				C188	3579473530	Ceramic Disc	0.047 uF 50 V K
<b>P4</b>	<b>054002007516</b>	<b>ASS'Y P.C.B INPUT FOR USA/CA</b>				<b>CONNECTORS</b>	
<b>P4</b>	<b>054002007965</b>	<b>ASS'Y P.C.B INPUT FOR EUROPE</b>		CN101	436109303331	Lead Ass'y 300mm 9P	
		<b>CAPACITORS</b>		CN102	436215163332	Lead Ass'y 160mm 15P	
C101L/R	3519101935	Ceramic Tubular	100 pF 50 V K	CN103	436107463331	Lead Ass'y 460mm 7P	
C102L/R	3529101935	Ceramic Tubular	100 pF 50V K Eur.	CN104	436104308331	Lead Ass'y 300mm 4P	
C103L/R	3479210971	Electrolytic SA	1 uF 50 V M	CN108	436402443331	Lead Ass'y 440mm 2P	
C104L/R	3479332041	Electric SG	33 uF 25 V M	CN109	436102223331	Lead Ass'y 220mm 2P	
C105L/R	3519223935	Ceramic Tubular	0.022 uF 50 V K	CP105	4428550120	Wafer 12P GD	
C106L/R	3679562120	Mylar	0.0056 uF 100 V J	CP106	4428550080	Wafer 8P GD	
C107L/R	3679182120	Mylar	0.0018 uF 100 V J	CP107	4428550060	Wafer 6P GD	
C108L/R	3479210971	Electrolytic SA	1 uF 50 V M	CP110 (CP2	4428525790	Wafer 3P AC	
C109/110	3479347041	Electric SG	47 uF 25 V M	CP207	4428525860	Wafer 1P AC	
C111L/R	3679182120	Mylar	0.0018 uF 100 V J	CP401	4428526370	Wafer, FPC, 25P	
C112L/R	3519101935	Ceramic Tubular	100 pF 50 V K	CP701	4428505510	Wafer 8P	
C113L/R	3529101935	Ceramic Tubular	100 pF 50V K Eur.	CP702	4428505810	Wafer 6P	
C114L/R	3519101935	Ceramic Tubular	100 pF 50 V K			<b>DIODES</b>	
C115L/R	3529101935	Ceramic Tubular	100 pF 50V K Eur.	D101-104	2058322101	1N4148M	
C116L/R	3519101935	Ceramic Tubular	100 pF 50 V K	D106-108	2058322101	1N4148M	
C117L/R	3529101935	Ceramic Tubular	100 pF 50V K Eur.	D110/111	2058322101	1N4148M	
C118L/R	3519101935	Ceramic Tubular	100 pF 50 V K	D116/117	2058322101	1N4148M	
C119L/R	3519101935	Ceramic Tubular	100 pF 50 V K			<b>ICs</b>	
C120L/R	3529101935	Ceramic Tubular	100 pF 50V K Eur.	IC101/102	2168017132	LC7821	
C121L/R	3519101935	Ceramic Tubular	100 pF 50 V K	IC103	2168206107	KIA6259P	
C122L/R	3519101935	Ceramic Tubular	100 pF 50 V K	IC104/105	2168206104	KIA7559P/KIA4559P	
C123L/R	3529101935	Ceramic Tubular	100 pF 50V K Eur.	IC106	2408000136	LTV817, Photo-Coupler	
C124L/R	3519101935	Ceramic Tubular	100 pF 50 V K			<b>TRANSISTORS</b>	
C125L/R	3519101935	Ceramic Tubular	100 pF 50 V K	Q101-104	2208606104	KTC1815Y/BKTC3198Y,NPN	
C126L/R	3529101935	Ceramic Tubular	100 pF 50V K Eur.	Q105	2208222105	DTA114YS, PNP	
C127L/R	3479247971	Electrolytic SA	4.7 uF 50 V M	Q106/107	2208606108	KTC2240/BKTC3200, NPN	
C128L/R	3479247971	Electrolytic SA	4.7 uF 50 V M	Q108/109	2208606104	KTC1815Y/BKTC3198Y,NPN	
C129-132	3479347041	Electric SG	47 uF 25 V M	Q110	2208206102	BKTA949/KTA1024, PNP	
C133/134	3479210971	Electrolytic SA	1 uF 50 V M	Q111	2208606107	KTC2229/KTC3206, NPN	
C135	3519102935	Ceramic Tubular	1000 pF 50 V K	Q113	2228406120	BKTC2235/KTC1027, NPN	
C136	3479210971	Electrolytic SA	1 uF 50 V M	Q114	2228106107	BKTA965/KTA1023, PNP	
C137	3479347041	Electric SG	47 uF 25 V M	Q117/118	2208606108	KTC2240/BKTC3200, NPN	
C138	3479222041	Electrolytic SA	22 uF 25 V M	Q119/120	2208606104	KTC1815Y/BKTC3198Y,NPN	
C139	3679223120	Mylar	0.022 uF 100 V J	Q121	2208206102	BKTA949/KTA1024, PNP	
C140/141	3479347041	Electric SG	47 uF 25 V M	Q122	2208606107	KTC2229/KTC3206, NPN	
C142	3479210971	Electrolytic SA	1 uF 50 V M	Q124	2228406120	BKTC2235/KTC1027, NPN	
C143	3519102935	Ceramic Tubular	1000 pF 50 V K	Q125	2228106107	BKTA965/KTA1023, PNP	
C144/145	3479210971	Electrolytic SA	1 uF 50 V M	Q128/129	2208606104	KTC1815Y/BKTC3198Y,NPN	
C146	3579681130	Ceramic Disc	680 pF 50 V K				
C147	3579471130	Ceramic Disc	470 pF 50 V K				
C148	3579270130	Ceramic Disc	27 pF 50 V K				



Ref. No.	Mfr. Part No.	Description	Version	Ref. No.	Mfr. Part No.	Description	Version
Q130	2208222105	DTA114YS, PNP		R183	3069272970	Carbon Film	2.7 kohm 1/5W J
				R184	3069102970	Carbon Film	1 kohm 1/5W J
				R185	3069121970	Carbon Film	120 ohm 1/5W J
				R186	3069221970	Carbon Film	220 ohm 1/5W J
				R187/188	3059278682	Cement	0.27 ohm 3 W K
				R189	3069271970	Carbon Film	270 ohm 1/5W J
				R190	3069472970	Carbon Film	4.7 kohm 1/5W J
				R191	3069153970	Carbon Film	15 kohm 1/5W J
				R192	3069100270	Carbon Film	10 ohm 1/4W J
				R193	3069100270	Carbon Film	10 ohm 1/4W J
				R194/195	3069243970	Carbon Film	24 kohm 1/5W J
				R196	3069392970	Carbon Film	3.9 kohm 1/5W J
				R197	3069470970	Carbon Film	47 ohm 1/5W J
				R198	3069473970	Carbon Film	47 kohm 1/5W J
				R199	3069271970	Carbon Film	270 ohm 1/5W J
				R200	3069101970	Carbon Film	100 ohm 1/5W J
				R201	3069102970	Carbon Film	1 kohm 1/5W J
				R202	3069102970	Carbon Film	1 kohm 1/5W J
					</		

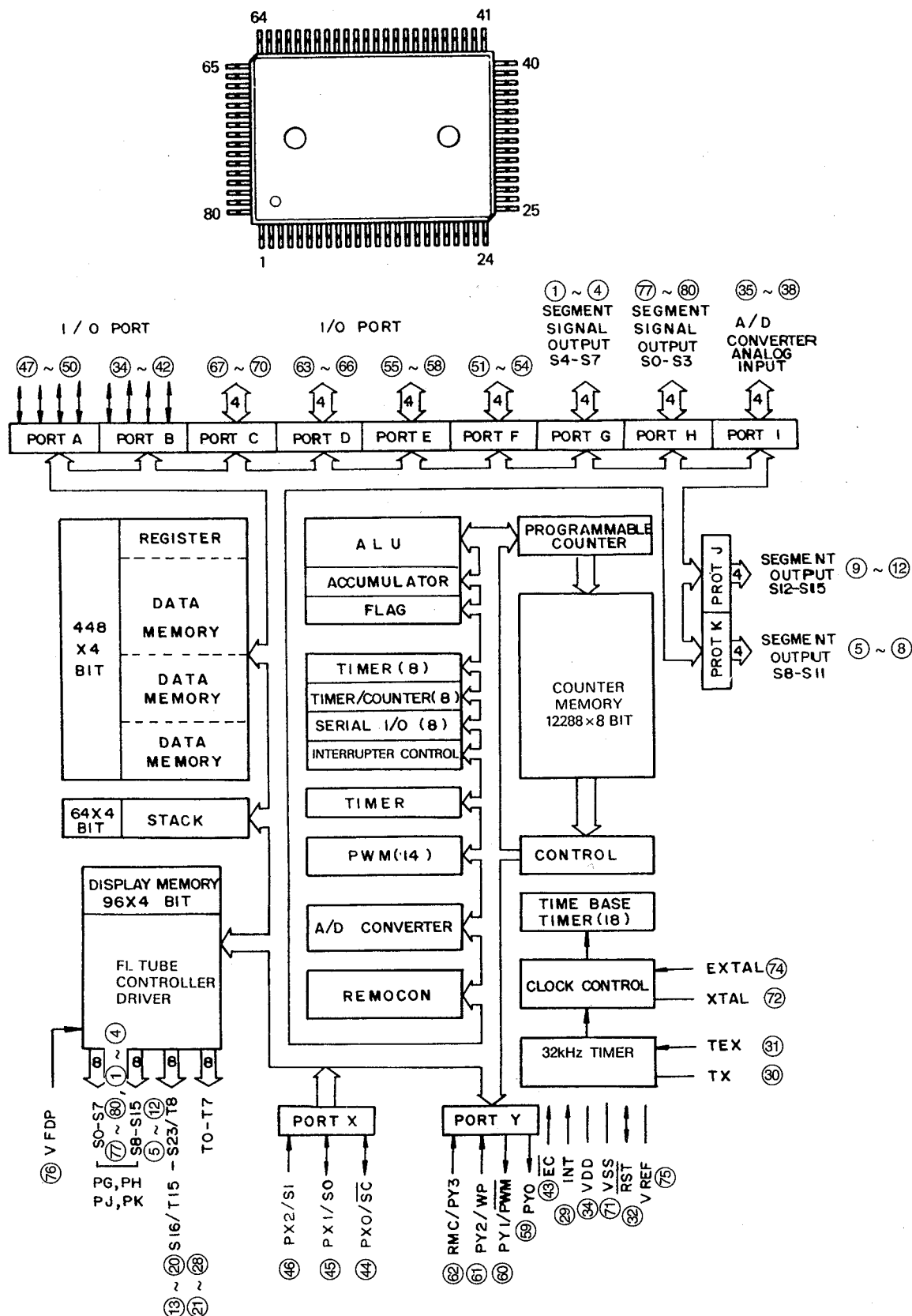
Ref. No.	Mfr. Part No.	Description	Version	Ref. No.	Mfr. Part No.	Description	Version
R842/843	3069102970	Carbon Film	1 kohm 1/5W J	C847/848	3479222061	Electrolytic SA	22 uF 35 V M
R844/845	3069302970	Carbon Film	3 kohm 1/5W J	C849/850	3679152120	Mylar	0.0015 uF 100 V J USA/CA
R850	3069471970	Carbon Film	470 ohm 1/5W J	C849/850	3679102120	Mylar	0.001 uF 100V J Eur.
R865	3069103970	Carbon Film	10 kohm 1/5W J	C851	3519151935	Ceramic Tubular	150 pF 50 V K
R867/868	3069104970	Carbon Film	100 kohm 1/5W J	C852/853	3479222971	Electrolytic SA	2.2 uF 50 V M
R869	3069102970	Carbon Film	1 kohm 1/5W J	C856/857	3679392120	Mylar	0.0039 uF 100 V J
R870	3069562970	Carbon Film	5.6 kohm 1/5W J	C858	3479310141	Electric SG	100 uF 25 V M
R888/889	3069271970	Carbon Film	270 ohm 1/5W J	TC801	3579200130	Ceramic, Disc	20 pF 50 V K
R890/891	3069221970	Carbon Film	220 ohm 1/5W J	TC802	3579100030	Ceramic, Disc	10 pF 50 V K
R892-898	3069271970	Carbon Film	270 ohm 1/5W J				
		<b>COILS</b>				<b>FILTERS</b>	
L801	2648601430	Coil, 20.8 mH		CF801-803	3908011001	SFE10.7MA8	
T801	2608201120	AM ANT		CF804	3908001380	SFZ450F	
T802	2638201150	OSC., AM		CF805	3908001020	BFU450C	
T803	2838501110	FM Quad DET(A)				<b>CONNECTORS</b>	
T804	2838501210	FM Quad DET(B)		CN105	4428560120	Connector, GB200-12S-LS	
T805	2848001250	AM IFT, P-7SB				<b>DIODES</b>	
T806/807	2658001050	MPX 19 k/38 kHz, Coil, Black		D801	2258599103	Zener, UZ 5.1 BSB	
VR801	3248020343	Semi, 20K(B)		D802/803	2058322101	1N4148M	
VR802	3248050343	Semi, 50K(B)		VD1/VD2	2058819106	KV1236Z, Diode, Varactor	
VR803	3248050243	Semi, 5K(B)				<b>ICs</b>	
VR804	3248020443	Semi, 200K(B)		IC801	2168017128	LA1266	
		<b>MISCELLANEOUS</b>		IC802	2138017112	LM7001	
33	4408108310	Terminal, Antenna	USA/CA	IC803	2168411105	HA12016	
	4408108210	Terminal, Antenna	Eur.			<b>TRANSISTORS</b>	
FE1	3928101790	FM Front End, 3-505H	USA/CA	Q801	2208406103	KTC1923Y, NPN	
FE1	3928801890	FM Front End, FE407-G60	Eur.	Q802	2018211100	2SK168, FET	
XT801	3908101031	Resonator, 7.2MHz		Q803	2208606108	KTC2240/BKTC3200, NPN	
		<b>END OF ASS'Y P.C.B TUNER</b>		Q804	2208222105	DTA114YS, PNP	
				Q805/806	2208606104	KTC1815Y/BKTC3198Y, NPN	
				Q808	2208222105	DTA114YS, PNP	
						<b>RESISTORS</b>	
P3	054002007503	<b>ASS'Y P.C.B SURROUND</b>		R801	3069104970	Carbon Film	100k ohm 1/5W J Eur.
		<b>CAPACITORS</b>		R802	3069623970	Carbon Film	62K ohm 1/5W J Eur.
C501	3479210071	Electrolytic SA	10 uF 50 V M	R803	3069471970	Carbon Film	470 ohm 1/5W J
C502	3479347041	Electric SG	47 uF 25 V M	R804	3069332970	Carbon Film	3.3 kohm 1/5W J
C503-505	3479210071	Electrolytic SA	10 uF 50 V M	R805/806	3069331970	Carbon Film	330 ohm 1/5W J
C506	3479347041	Electric SG	47 uF 25 V M	R807	3069103970	Carbon Film	10 kohm 1/5W J
C507/508	3479210071	Electrolytic SA	10 uF 50 V M	R808	3069332970	Carbon Film	3.3 kohm 1/5W J
C509/510	3479347041	Electric SG	47 uF 25 V M	R809	3069473970	Carbon Film	47 kohm 1/5W J
C511	3519101935	Ceramic Tubular	100 pF 50 V K	R810	3069820970	Carbon Film	82 ohm 1/5W J
C512	3479210971	Electrolytic SA	1 uF 50 V M	R811	3069243970	Carbon Film	24 kohm 1/5W J
C513	3479247871	Electrolytic SA	0.47 uF 50 V J	R812	3069103970	Carbon Film	10 kohm 1/5W J
C514	3479347041	Electric SG	47 uF 25 V M	R813	3069272970	Carbon Film	2.7 kohm 1/5W J
C515	3519681935	Ceramic Tubular	680 pF 50 V K	R814	3069472970	Carbon Film	4.7 kohm 1/5W J
C516	3479210971	Electrolytic SA	1 uF 50 V M	R815	3069222970	Carbon Film	2.2 kohm 1/5W J USA/CA
C517	3479347041	Electric SG	47 uF 25 V M	R815	3069332970	Carbon Film	3.3k ohm 1/5W J Eur.
C518	3479210971	Electrolytic SA	1 uF 50 V M	R816	3069272970	Carbon Film	2.7 kohm 1/5W J
C519	3519681935	Ceramic Tubular	680 pF 50 V K	R817/818	3069104970	Carbon Film	100 kohm 1/5W J
C520	3479210971	Electrolytic SA	1 uF 50 V M	R819	3069473970	Carbon Film	47 kohm 1/5W J
C521	3519101935	Ceramic Tubular	100 pF 50 V K	R820	3069223970	Carbon Film	22 kohm 1/5W J
C522	3679104297	Mylar	0.1 uF 63 V J	R821-823	3069102970	Carbon Film	1 kohm 1/5W J
C523	3679223297	Mylar	0.022 uF 63 V J	R824	3069821970	Carbon Film	820 ohm 1/5W J
C524/525	3479247971	Electrolytic SA	4.7 uF 50 V M	R825	3069152970	Carbon Film	1.5 kohm 1/5W J
C526-528	3679224297	Mylar	0.22 uF 63 V J	R826	3069103970	Carbon Film	10 kohm 1/5W J
C529	3679684297	Mylar	0.68 uF 63 V J	R827	3069102970	Carbon Film	1 kohm 1/5W J
C530	3619471110	Poly	470 pF 50 V J	R828	3069101970	Carbon Film	100 ohm 1/5W J
C531	3679473120	Mylar	0.047 uF 100 V J	R829/830	3069104970	Carbon Film	100 kohm 1/5W J
C532	3679222120	Mylar	0.0022 uF 100 V J	R831/832	3069223970	Carbon Film	22 kohm 1/5W J
C533	3479210971	Electrolytic SA	1 uF 50 V M	R833/834	3069332970	Carbon Film	3.3 kohm 1/5W J USA/CA
C534	3479322131	Electric SG	220 uF 16 V M	R833/834	3069203970	Carbon Film	2k ohm 1/5W J Eur.
C535	3679562120	Mylar	0.0056 uF 100 V J	R835/836	3069473970	Carbon Film	47 kohm 1/5W J
C536/537	3479210971	Electrolytic SA	1 uF 50 V M	R837	3069392970	Carbon Film	3.9 kohm 1/5W J
C538	3479322131	Electric SG	220 uF 16 V M	R838-839	3069332970	Carbon Film	3.3 kohm 1/5W J USA/CA
C539	3479210071	Electrolytic SA	10 uF 50 V M	R838/839	3069243970	Carbon Film	2.4k ohm 1/5W J Eur.
C540	3479222871	Electrolytic SA	0.22 uF 50 V K	R840-841	3069332970	Carbon Film	3.3 kohm 1/5W J USA/CA
C541-543	3479210971	Electrolytic SA	1 uF 50 V M				
C544-546	3679104297	Mylar	0.1 uF 63 V J				
C547/548	3679224297	Mylar	0.22 uF 63 V J				
C549	3679104297	Mylar	0.1 uF 63 V J				
C550	3679473120	Mylar	0.047 uF 100 V J				

Ref. No.	Mfr. Part No.	Description	Version	Ref. No.	Mfr. Part No.	Description	Version
C551	3619681110	Poly	680 pF 50 V J	R527	3069182970	Carbon Film	1.8 kohm 1/5W J
C552	3679104297	Mylar	0.1 uF 63 V J	R528	3069564970	Carbon Film	560 kohm 1/5W J
C553	3619681110	Poly	680 pF 50 V J	R529-531	3069102970	Carbon Film	1 kohm 1/5W J
C554	3679473120	Mylar	0.047 uF 100 V J	R532	3069334970	Carbon Film	330 kohm 1/5W J
C555	3479210061	Electrolytic SA	10 uF 35 V M	R533-535	3069153970	Carbon Film	15 kohm 1/5W J
C556	3479210971	Electrolytic SA	1 uF 50 V M	R536-538	3069104970	Carbon Film	100 kohm 1/5W J
C557/558	3679104297	Mylar	0.1 uF 63 V J	R539	3069470970	Carbon Film	47 ohm 1/5W J
C559	3479210971	Electrolytic SA	1 uF 50 V M	R540/541	3069104970	Carbon Film	100 kohm 1/5W J
C560	3479210061	Electrolytic SA	10 uF 35 V M	R542	3069473970	Carbon Film	47 kohm 1/5W J
C561	3679472120	Mylar	0.0047 uF 100 V J	R543	3069752970	Carbon Film	7.5 kohm 1/5W J
C562	3479222071	Electrolytic SA	22 uF 50 V M	R544	3069473970	Carbon Film	47 kohm 1/5W J
C563	3679562120	Mylar	0.0056 uF 100 V J	R545	3069153970	Carbon Film	15 kohm 1/5W J
C564	3479310121	Electric SG	100 uF 10 V M	R546	3069752970	Carbon Film	7.5 kohm 1/5W J
C565	3579104530	Ceramic Tubular	0.1 uF 50 V K	R547	3069473970	Carbon Film	47 kohm 1/5W J
C566	3679562120	Mylar	0.0056 uF 100 V J	R548	3069153970	Carbon Film	15 kohm 1/5W J
C567	3579471130	Ceramic Disc	470 pF 50 V K	R549	3069223970	Carbon Film	22 kohm 1/5W J
C568	3679104297	Mylar	0.1 uF 63 V J	R550	3069106970	Carbon Film	10 Mohm 1/5W J
C569	3479347041	Electric SG	47 uF 25 V M	R551	3069223970	Carbon Film	22 kohm 1/5W J
C570/571	3679473120	Mylar	0.047 uF 100 V J	R552	3069104970	Carbon Film	100 kohm 1/5W J
C572	3679104297	Mylar	0.1 uF 63 V J	R553	3069822970	Carbon Film	8.2 kohm 1/5W J
C573	3679332120	Mylar	0.0033 uF 100 V J	R554	3069752970	Carbon Film	7.5 kohm 1/5W J
C574	3579471130	Ceramic Disc	470 pF 50 V K	R555	3069560970	Carbon Film	56 ohm 1/5W J
C576/577	3579271130	Ceramic Disc	270 pF 100 V K	R556	3069183970	Carbon Film	18 kohm 1/5W J
C578-580	3519101935	Ceramic Tubular	100 pF 50 V K	R557	3069562970	Carbon Film	5.6 kohm 1/5W J
C582	3479347041	Electric SG	47 uF 25 V M	R558	3069220970	Carbon Film	22 ohm 1/5W J
C583	3579103530	Ceramic Tubular	0.01 uF 50 V K	R559	3069153970	Carbon Film	15 kohm 1/5W J
C584	3519101935	Ceramic Tubular	100 pF 50 V K	R560	3069220970	Carbon Film	22 ohm 1/5W J
C585	3479310121	Electric SG	100 uF 10 V M	R561	3069183970	Carbon Film	18 kohm 1/5W J
<b>CONNECTORS</b>				R562	3069153970	Carbon Film	15 kohm 1/5W J
CNT106	4428560080	Connector, GB200-08S-LS		R563	3069470970	Carbon Film	47 ohm 1/5W J
CNT107	4428560060	Connector, GB200-06S-LS		R564	3069105970	Carbon Film	1 Mohm 1/5W J
CNT602	4428507010	Wafer 9P		R565-567	3069102970	Carbon Film	1 kohm 1/5W J
<b>DIODES</b>				R569	3069471970	Carbon Film	470 ohm 1/5W J
D501-503	2058322101	1N4148M		R570	3069102970	Carbon Film	1 kohm 1/5W J
<b>ICs</b>				R571/572	3069102970	Carbon Film	1 kohm 1/5W J
IC501/502	2168206103	KIA7559S/KIA4559S		R573	3069101970	Carbon Film	100 ohm 1/5W J
IC503/504	2138017108	LC4966		<b>X-TAL</b>			
IC505	2168206104	KIA7559P/KIA4559P		X501	3938131740	Resonator, 2MHz	
IC506	2138007124	TC9176P		<b>END OF ASS'Y P.C.B SURROUND</b>			
IC507	2168020115	NJM2177L		<b>P5 058582000079 ASS'Y COMMANDER</b>			
IC508	2168020114	NJU9701D		1	048582001124	Cover, top	
IC509	2138009115	MC14094BCP		2	8582001210	Cover, Bottom	
<b>TRANSISTORS</b>				3	8583004410	Cover, Battery	
Q501/502	2208222105	DTA114YS, PNP		4	048552003671	Inlay, Commander	
Q503/504	2208622106	DTC114YS, NPN		5	048722000991	Button, Silicon	
Q505/506	2208222105	DTA114YS, PNP		6	8555040210	Cover, Upper	
Q507/508	2208622106	DTC114YS, NPN		7	6555009710	Spring, Battery (+)	
<b>RESISTORS</b>				8	6555009810	Spring, Battery (-)	
R501	3069101970	Carbon Film	100 ohm 1/5W J	9	6555605310	Spring, Battery (B)	
R502/503	3069104970	Carbon Film	100 kohm 1/5W J	10	8019120103	Screw, PM 2x10 ZNB	
R504	3069101970	Carbon Film	100 ohm 1/5W J	C01	3409247022	Electric SS	47 uF 10 V M
R505-508	3069104970	Carbon Film	100 kohm 1/5W J	C02	3519103935	Ceramic Tubula	0.01 uF 50 V M
R510/511	3069154970	Carbon Film	150 kohm 1/5W J	C04	3519470935	Ceramic Tubula	47 pF 50 V M
R512/513	3069101970	Carbon Film	100 ohm 1/5W J	D01	2408001139	Diode, IR-LED EL-5HIR7	
R514/515	3069223970	Carbon Film	22 kohm 1/5W J	IC01	2138313214	IC, u-PD6126A	
R516	3069124970	Carbon Film	120 kohm 1/5W J	Q01	2208606112	KTD1302, NPN	
R517	3069103970	Carbon Film	10 kohm 1/5W J	R01	3069229970	Carbon Film	2.2 ohm 1/5W J
R518	3069104970	Carbon Film	100 kohm 1/5W J	R02	3069101970	Carbon Film	100 ohm 1/5W J
R519	3069101970	Carbon Film	100 ohm 1/5W J	X-TAL	3938101890	CRA455, Resonator, Ceramic	
R520	3069473970	Carbon Film	47 kohm 1/5W J	<b>END OF ASS'Y COMMANDER</b>			
R521	3069362970	Carbon Film	3.6 kohm 1/5W J	<b>P4-2 054002007969 ASS'Y P.C.B OUTLET FOR EUROPE ONLY</b>			
R522	3069564970	Carbon Film	560 kohm 1/5W J	5508302535	Fuse, 5T 2.5 A, 250 V, SEMKO		Eur.
R523	3069182970	Carbon Film	1.8 kohm 1/5W J	CNT201CD	4358850216	CTB, 0216, BL102R, MXH40113-2	Eur.
R524	3069101970	Carbon Film	100 ohm 1/5W J	CNT202CD	4359852214	CTB, 0114, LV, Diamond, SL R#22	Eur.
R525	3069104970	Carbon Film	100 kohm 1/5W J	48	4448103610	Outlet, AC, YKE31-0090	Eur.
R526	3069472970	Carbon Film	4.7 kohm 1/5W J	P1/P2	4228001410	Pin, Solder	Eur.

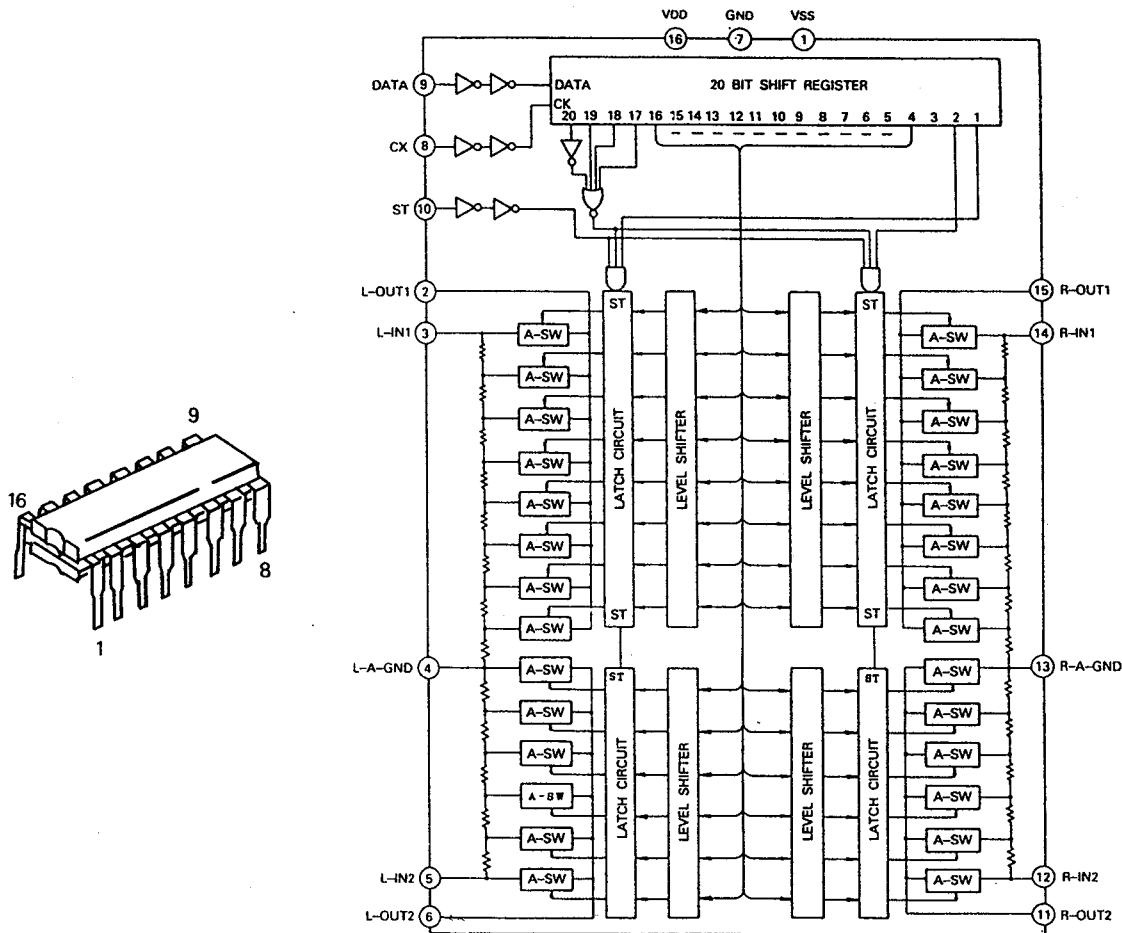


## SEMICONDUCTOR LEAD IDENTIFICATION &amp; INTERNAL DIAGRAM

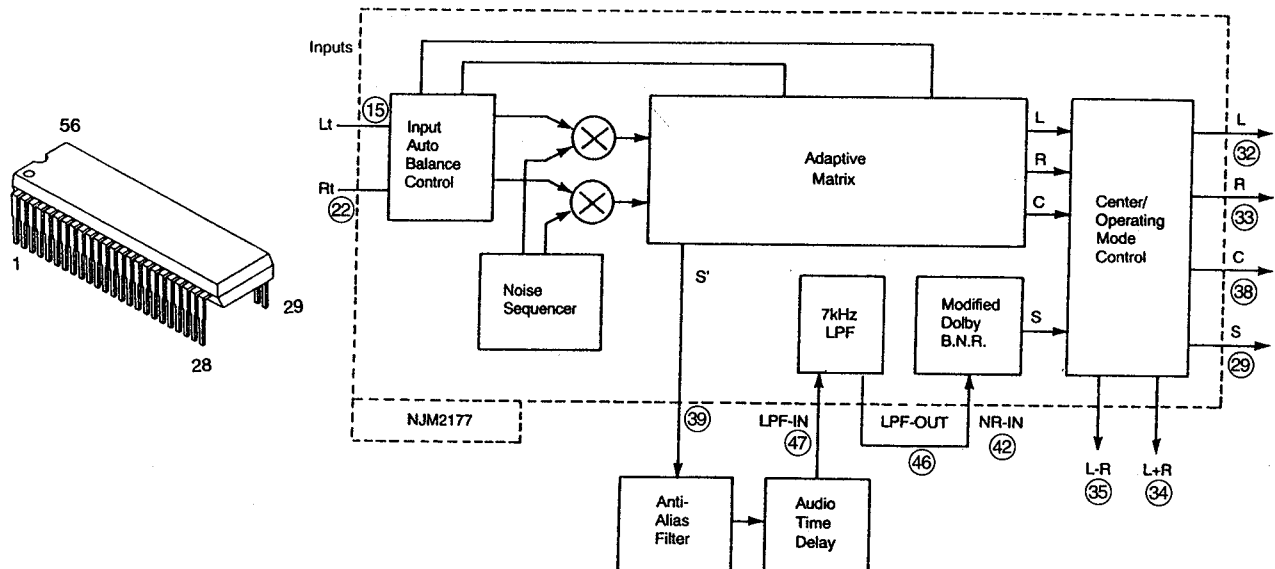
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(Top View)



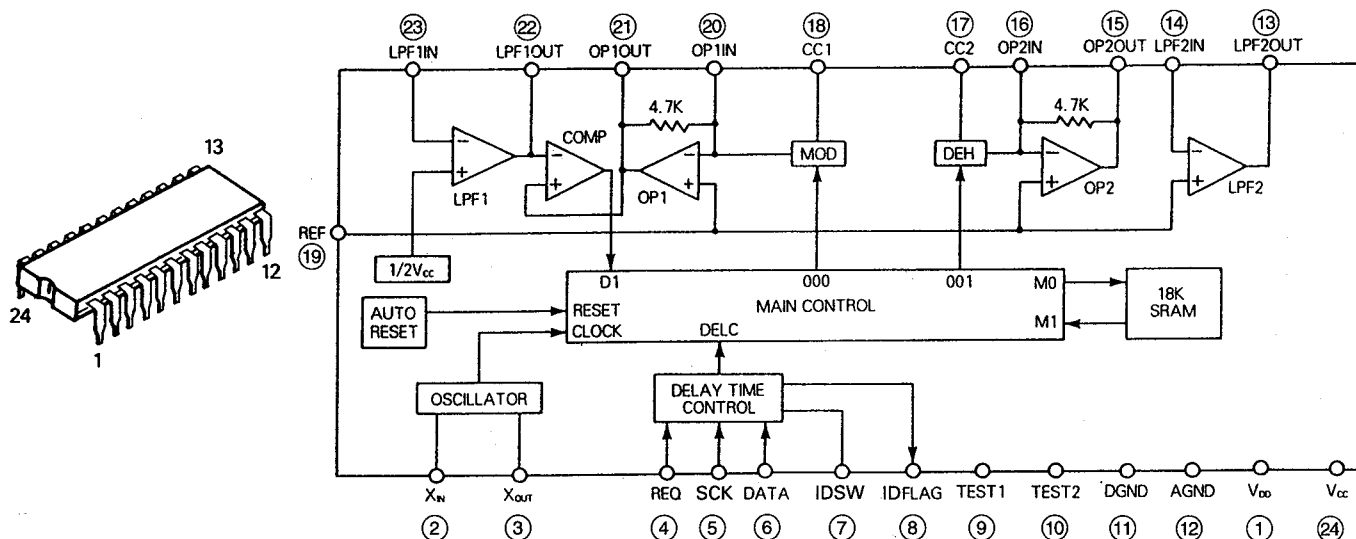
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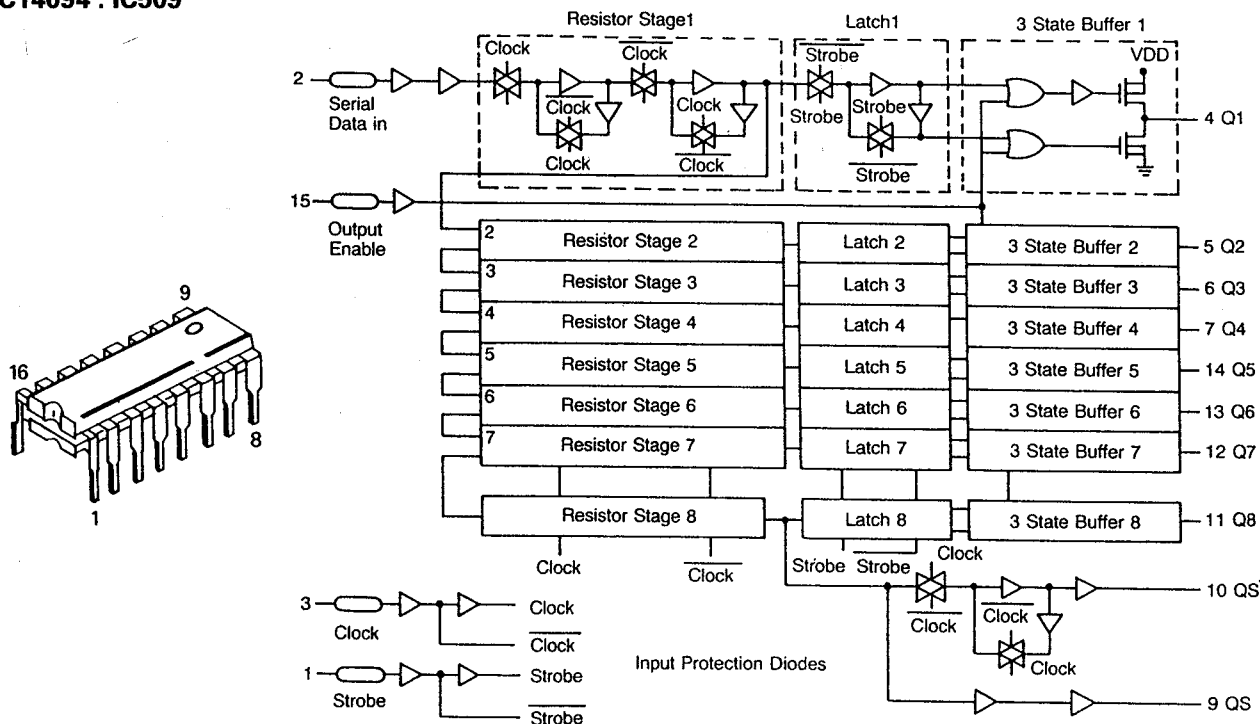
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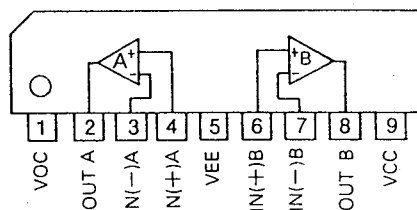
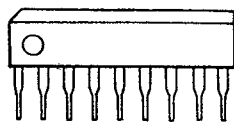
**NJU9701 : IC508**



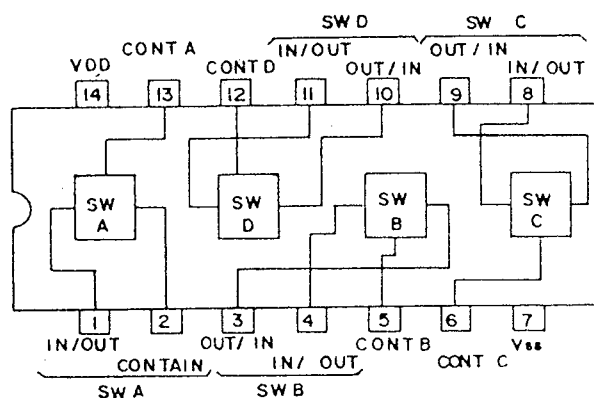
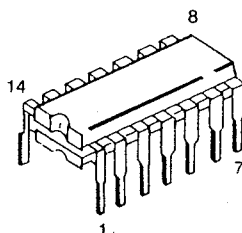
**MC14094 : IC509**



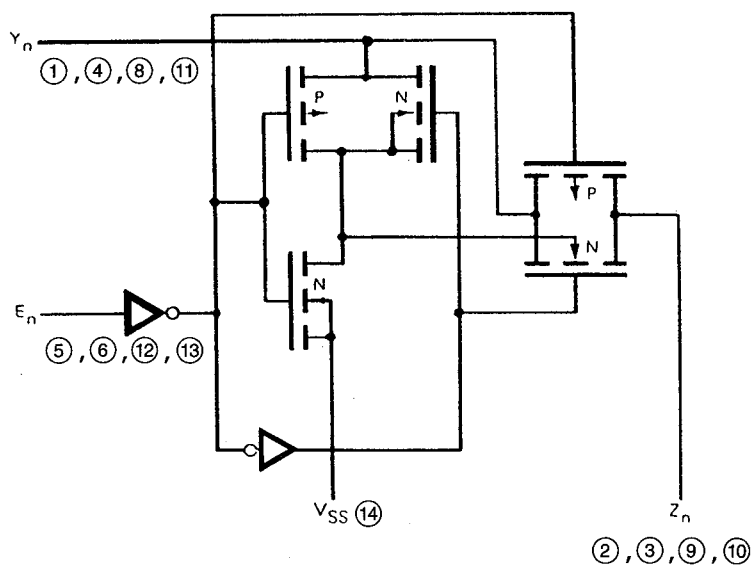
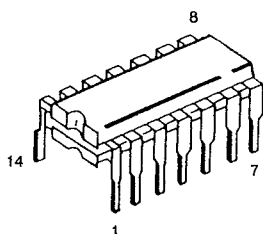
**KIA4559S : IC501, IC502, IC701  
(KIA7559)**



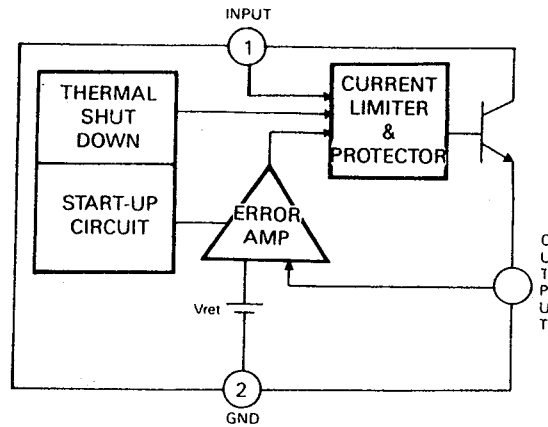
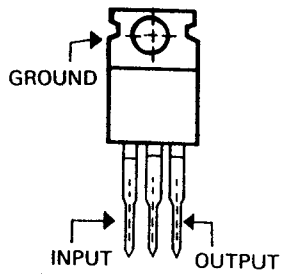
**LC4966B : IC503, IC504**



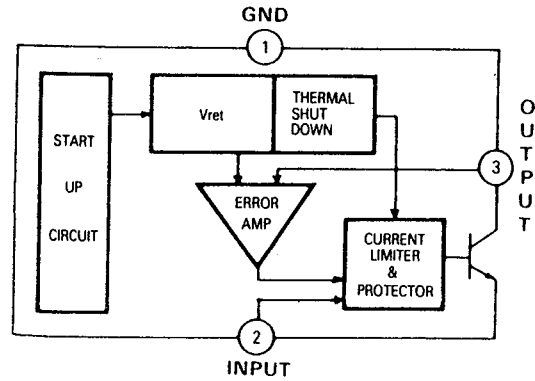
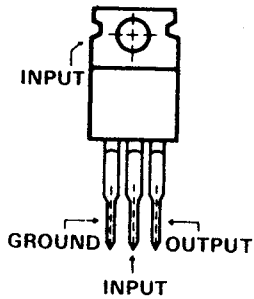
**GD4066 : IC301**



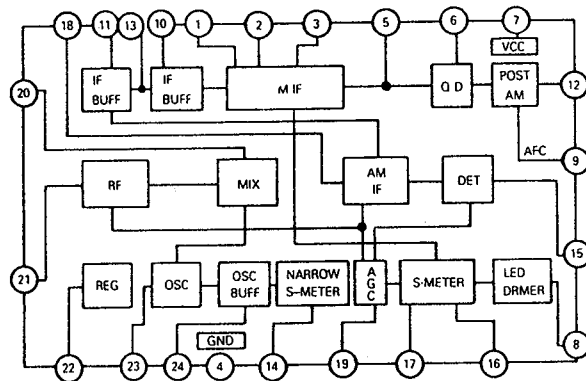
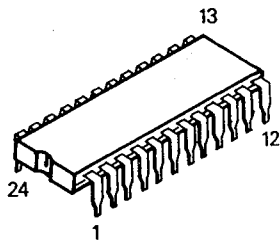
**GD78XX : IC201, IC202, IC203**



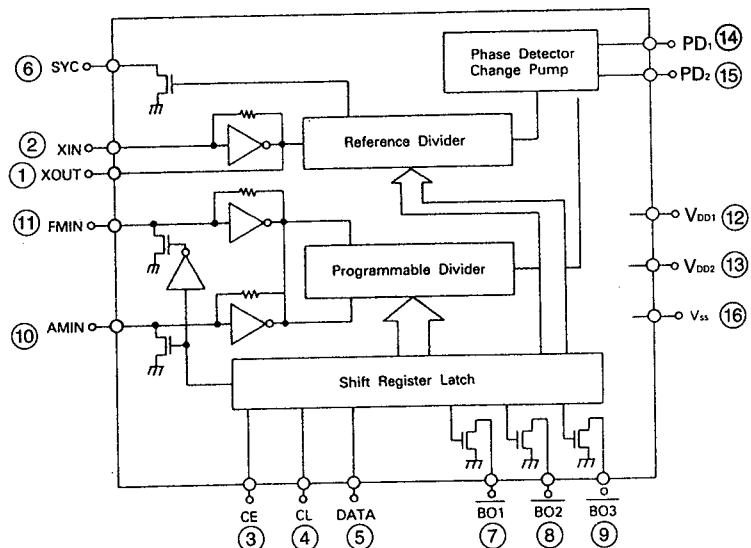
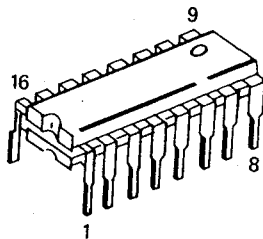
**GD7915 : IC204**



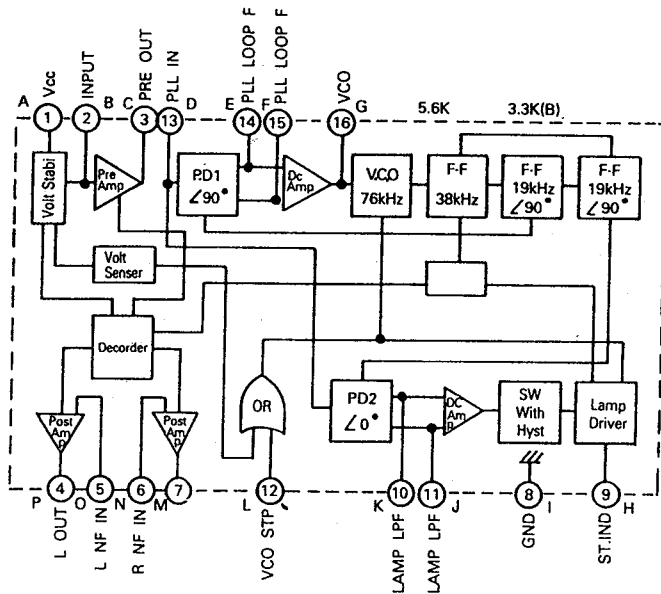
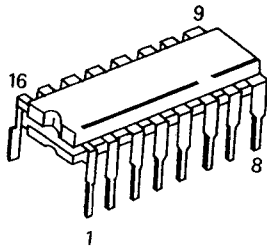
**LA1266 : IC801**



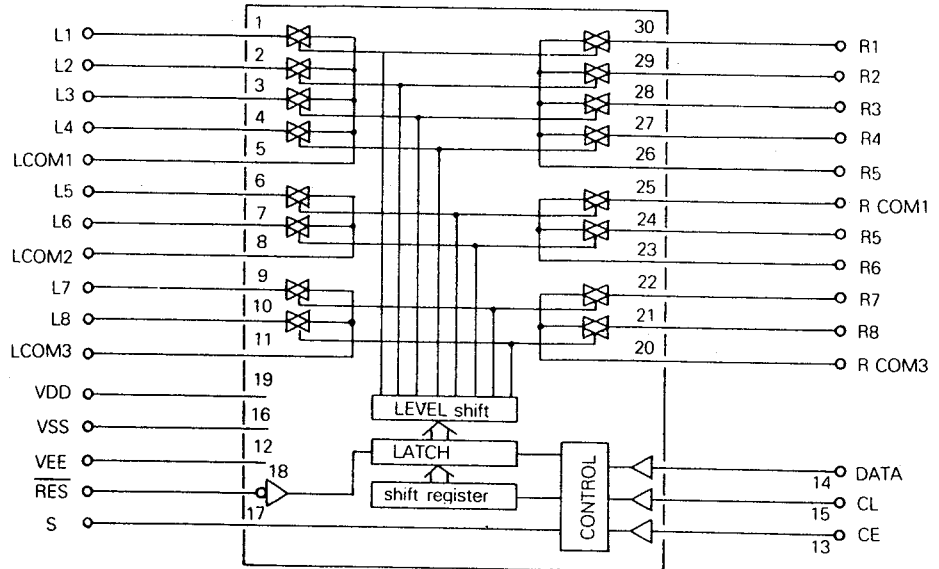
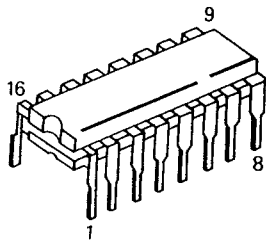
**LM7001 : IC802**



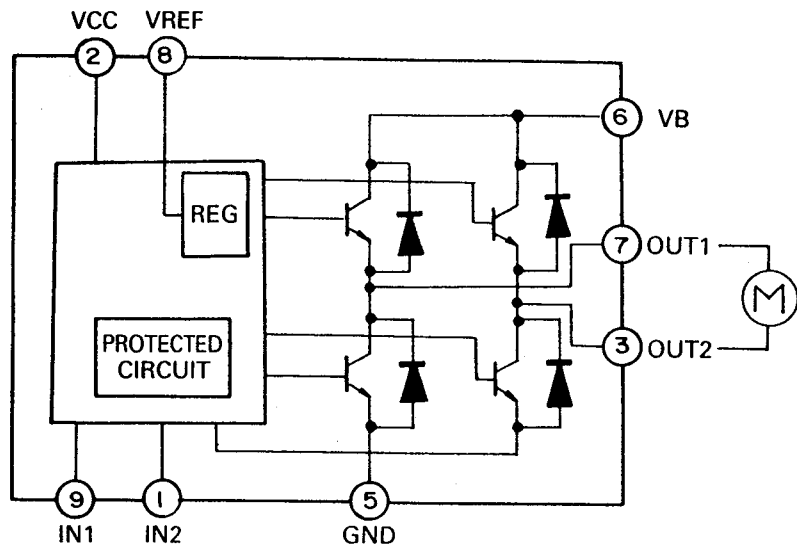
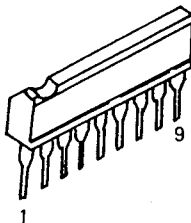
HA12016 : IC803



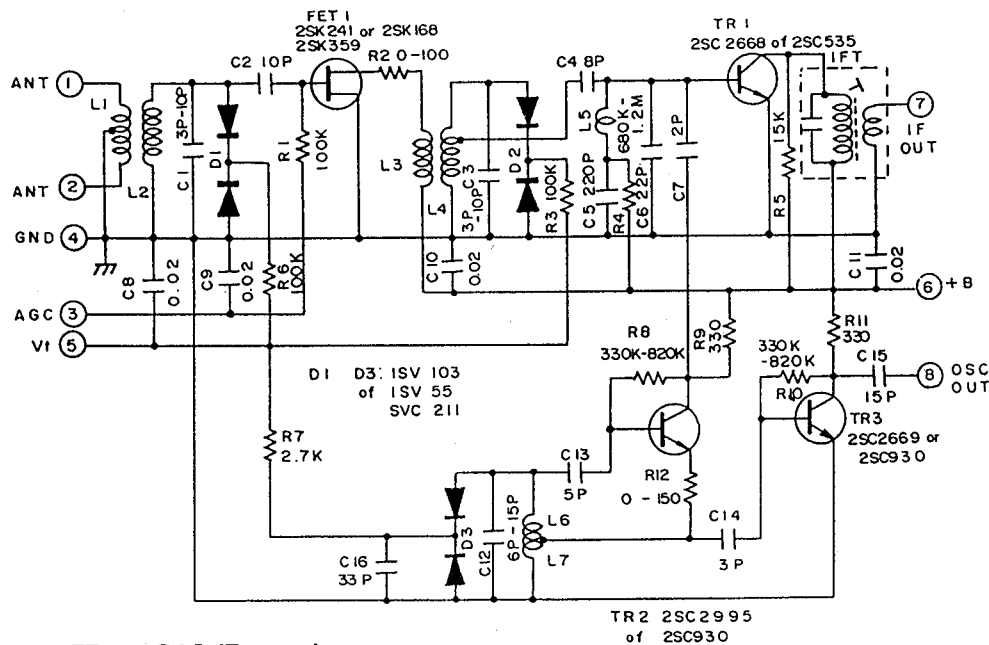
LC7821 : IC101, IC102



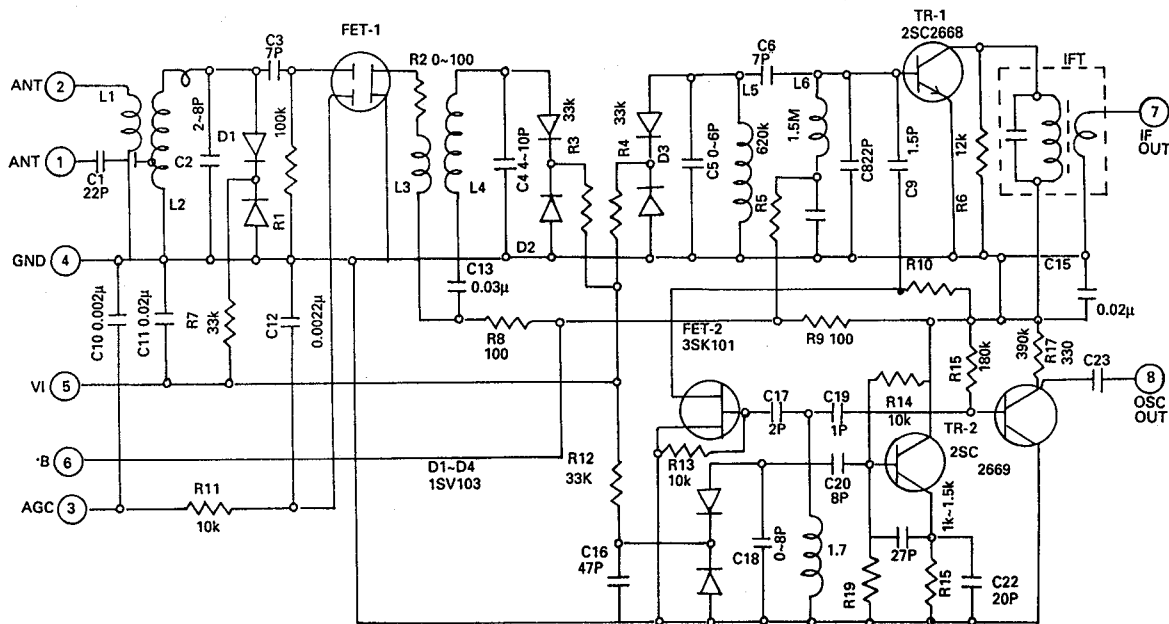
TA7291S : IC603



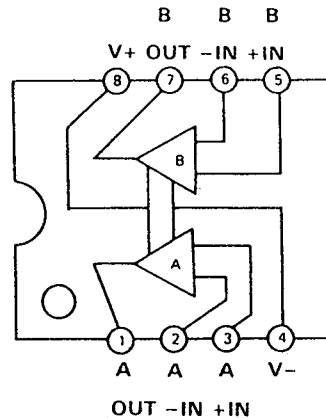
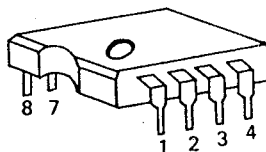
FRONT-END : FE FTH3-505H(USA/CA)



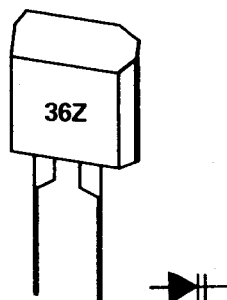
FE407-G60 (Europe)



IC104, IC105, IC505, IC601, IC602  
(KIA 4559P)  
(KIA 6259P : IC103)



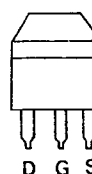
KV1236Z : VD1, VD2



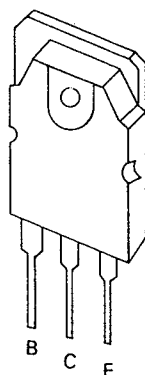
2SK168D : Q802



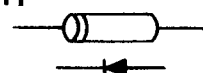
KTC1923Y : Q801



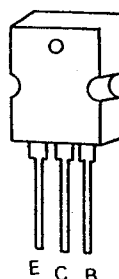
2SC3181 : Q216L/R  
2SA1264 : Q217L/R  
KTD718 : Q115, Q126  
KTB688 : Q116, Q127



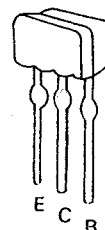
IN4148 : D101~D114, D219~D224  
D303, D301, D302, D401~D420  
D501~D503, D802, D803  
IN4002 : D201~D205  
D212~D217  
D426  
6A3 : D208~D211



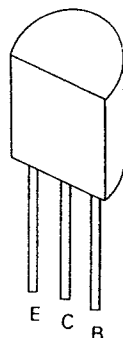
2SC4137: Q213 L/R,  
Q112, Q123



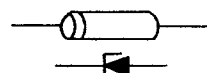
DTA114Y : Q130, Q602, Q604, Q105,  
Q501, Q502, Q804, Q223, Q505,  
Q506, Q808  
DTC114Y : Q260, Q503, Q504, Q507,  
Q508, Q203  
DTC114T : Q605



2SD1302S : Q601, Q603, Q701, Q702,  
Q805, Q806  
KTC2240BL : Q106, Q107, Q117, Q118,  
Q2072L/R, Q210L/R, Q803  
KTC2235C : Q113, Q124  
KTA949 : Q110, Q121, Q211L/R  
KTA1015Y : Q703, Q301, Q303, Q305,  
Q219, Q205 L/R  
KTC1815Y : Q101~Q104, Q108, Q109  
Q119, Q120, Q128, Q129  
Q201, Q401, Q402, Q302  
Q304, Q306  
Q218L/R, Q220, Q221  
KTA970 : Q206 L/R, Q208L/R  
Q209 L/R

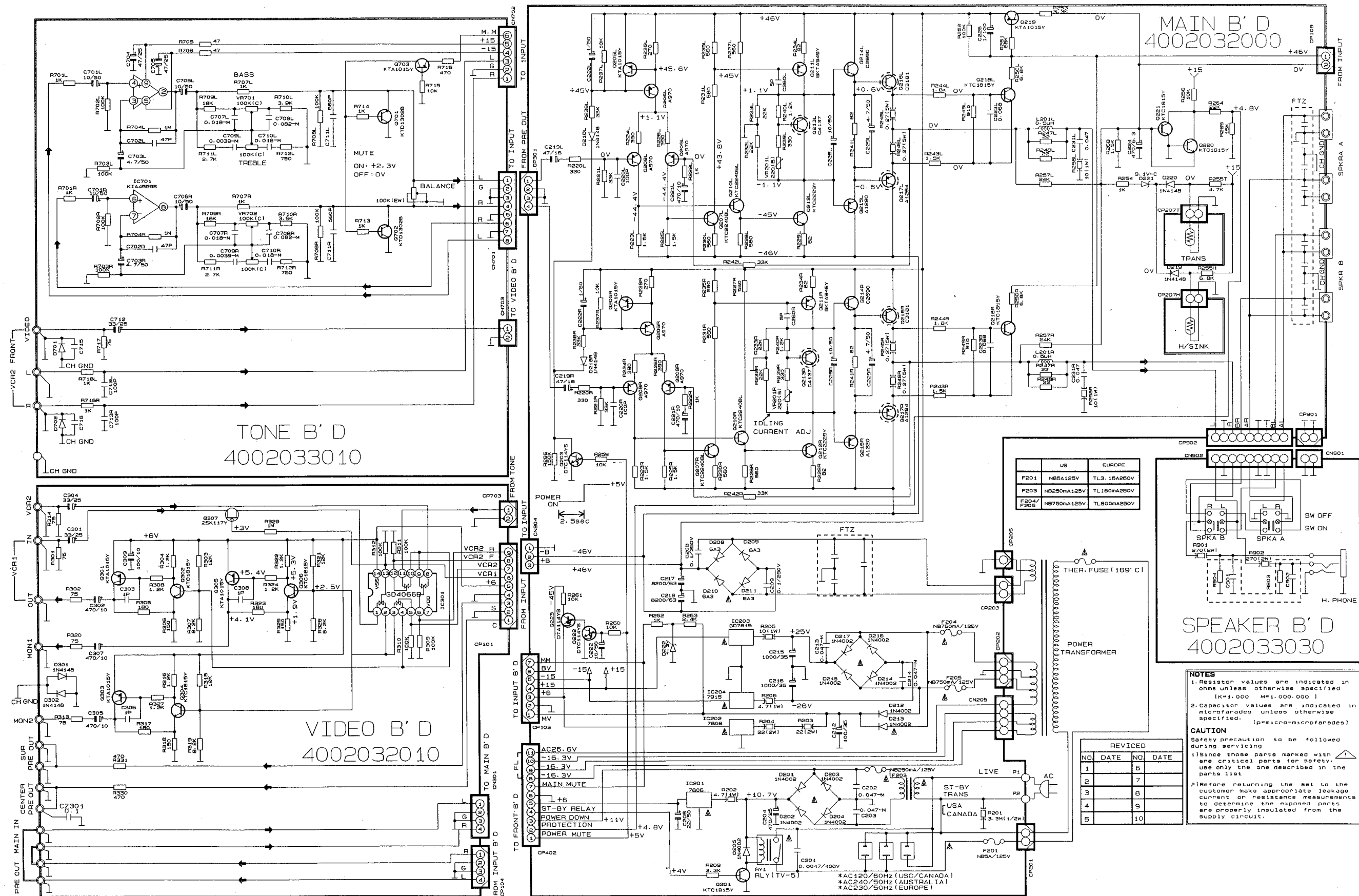


ZD9. 1BS : D221, D424 ZD16BM: D422, D423  
ZD4.3BS : D222, D421, D602  
ZD5.1 : D801

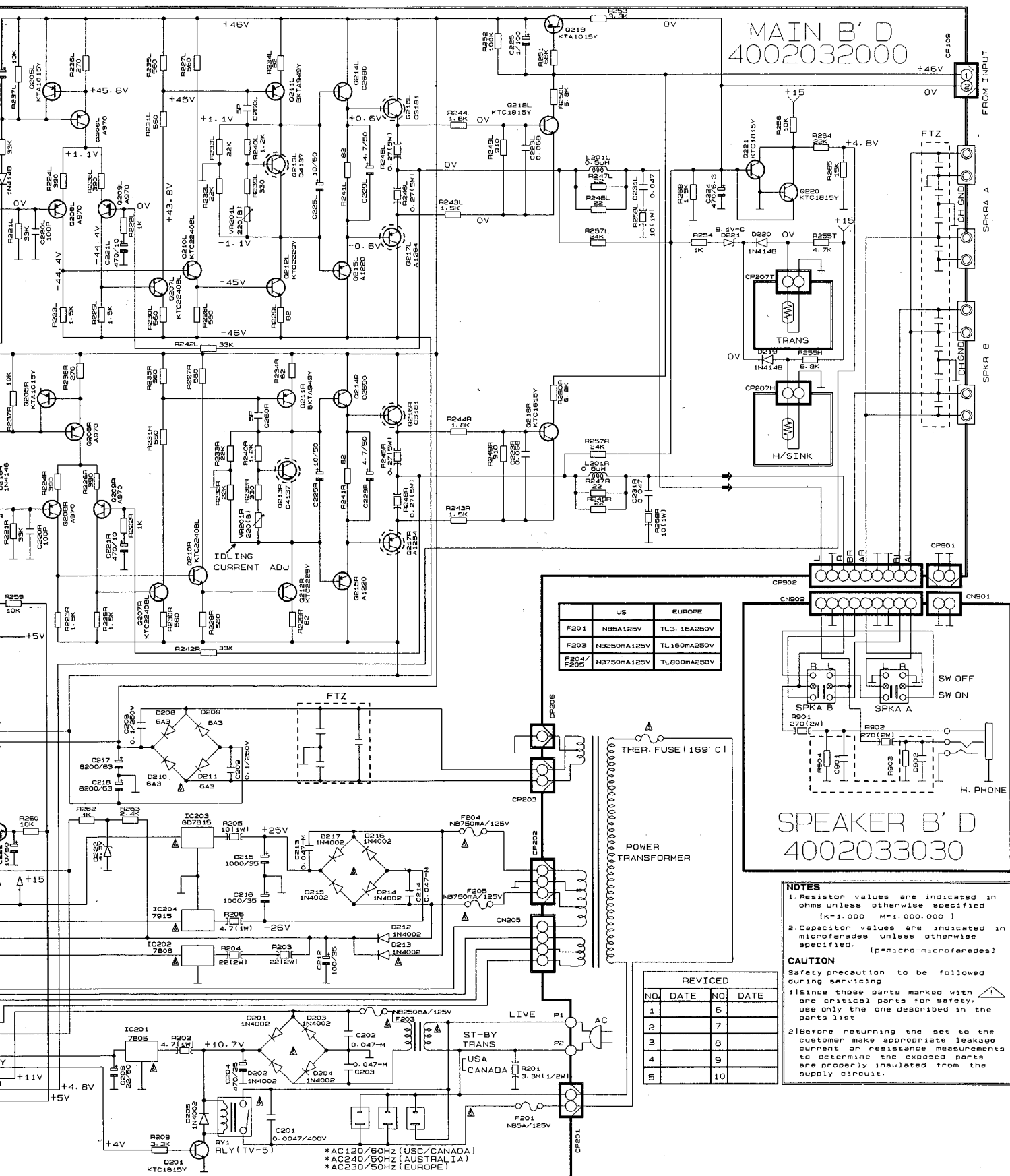




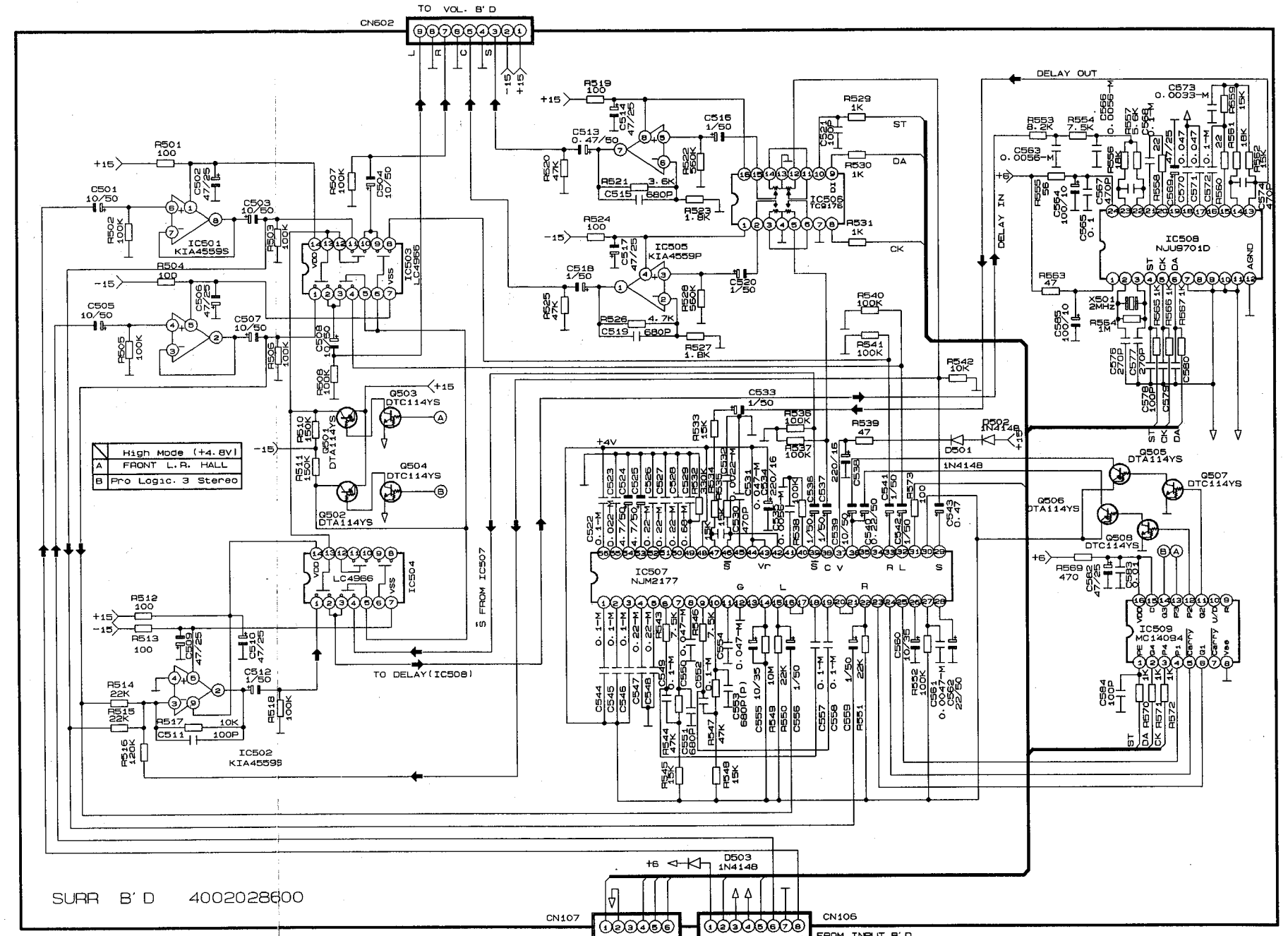
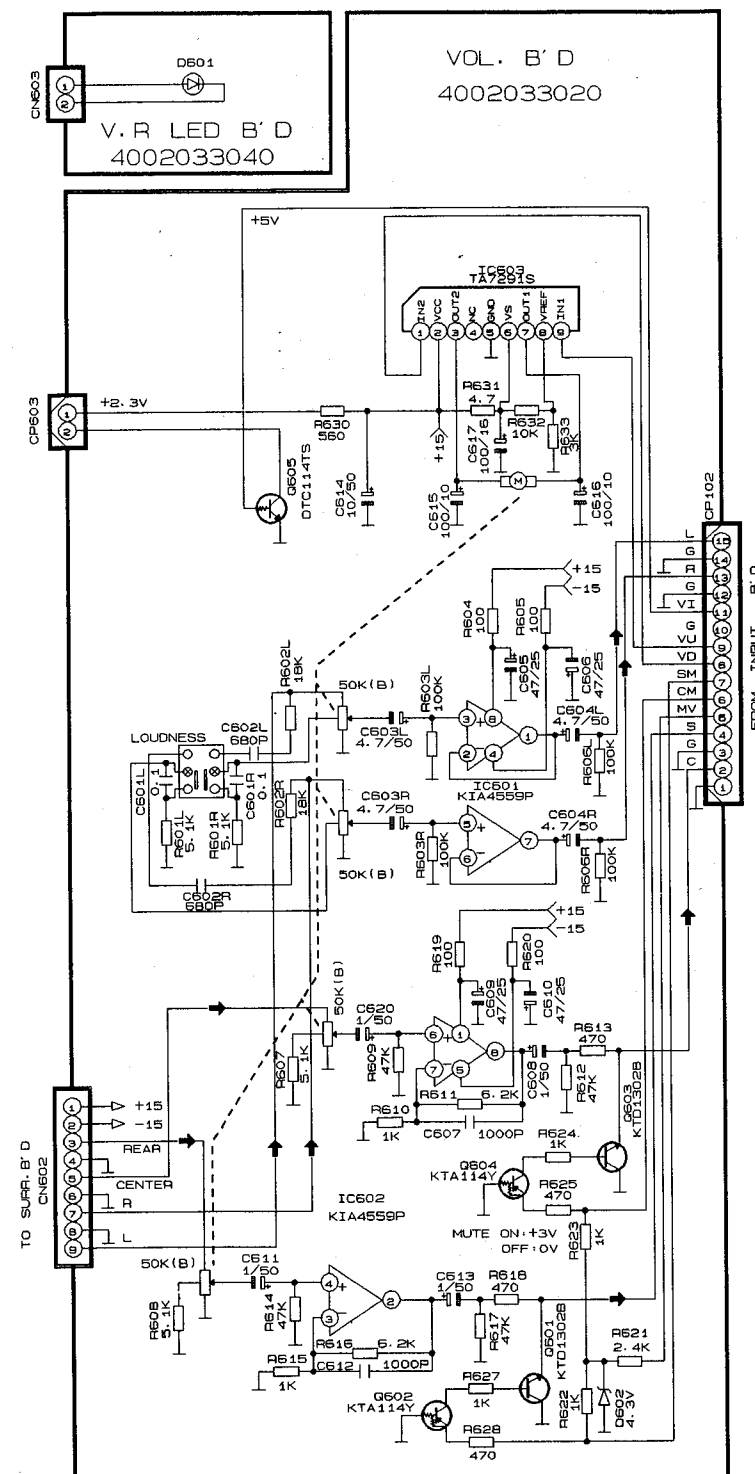
### SCHEMATIC DIAGRAM I







# SCHEMATIC DIAGRAM II



**NOTES**

1. Resistor values are indicated in ohms unless otherwise specified. [K=1,000 M=1,000,000]
2. Capacitor values are indicated in microfarads unless otherwise specified. [p=micro-microfarads]

**CAUTION**

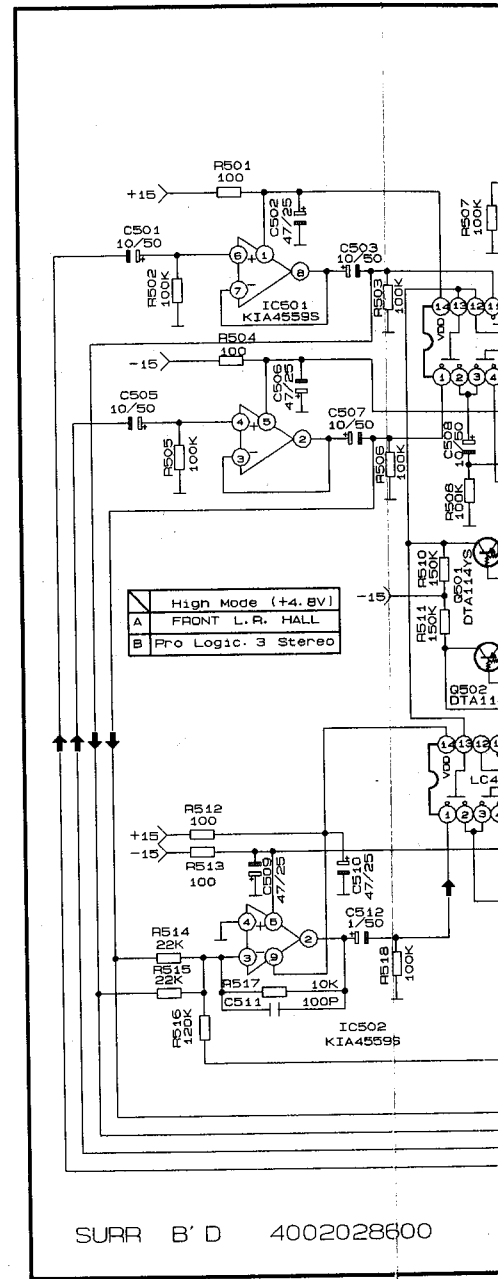
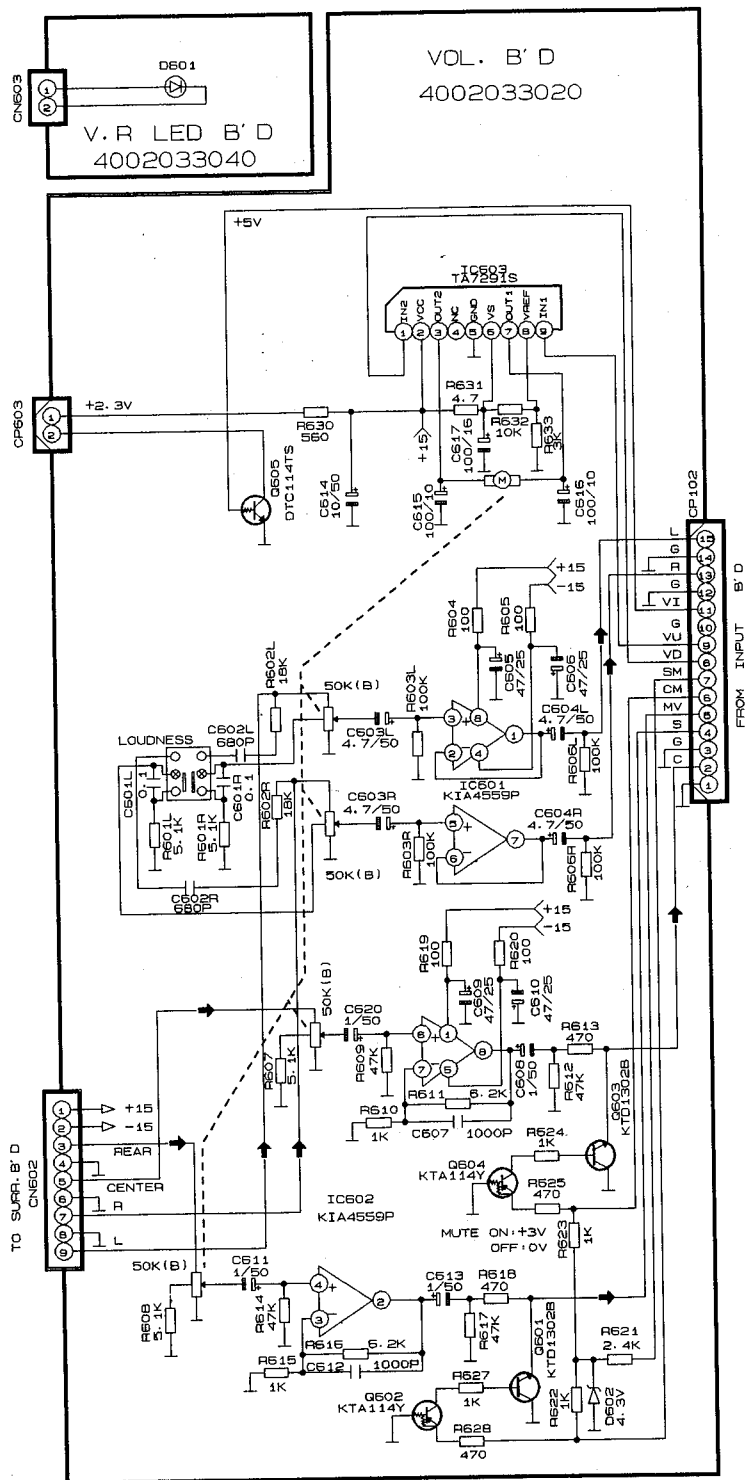
Safety precaution to be followed during servicing:

- 1) Since those parts marked with a triangle are critical parts for safety, use only the one described in the parts list.
- 2) Before returning the set to the customer make appropriate leakage current or resistance measurements to determine the exposed parts are properly insulated from the supply circuit.

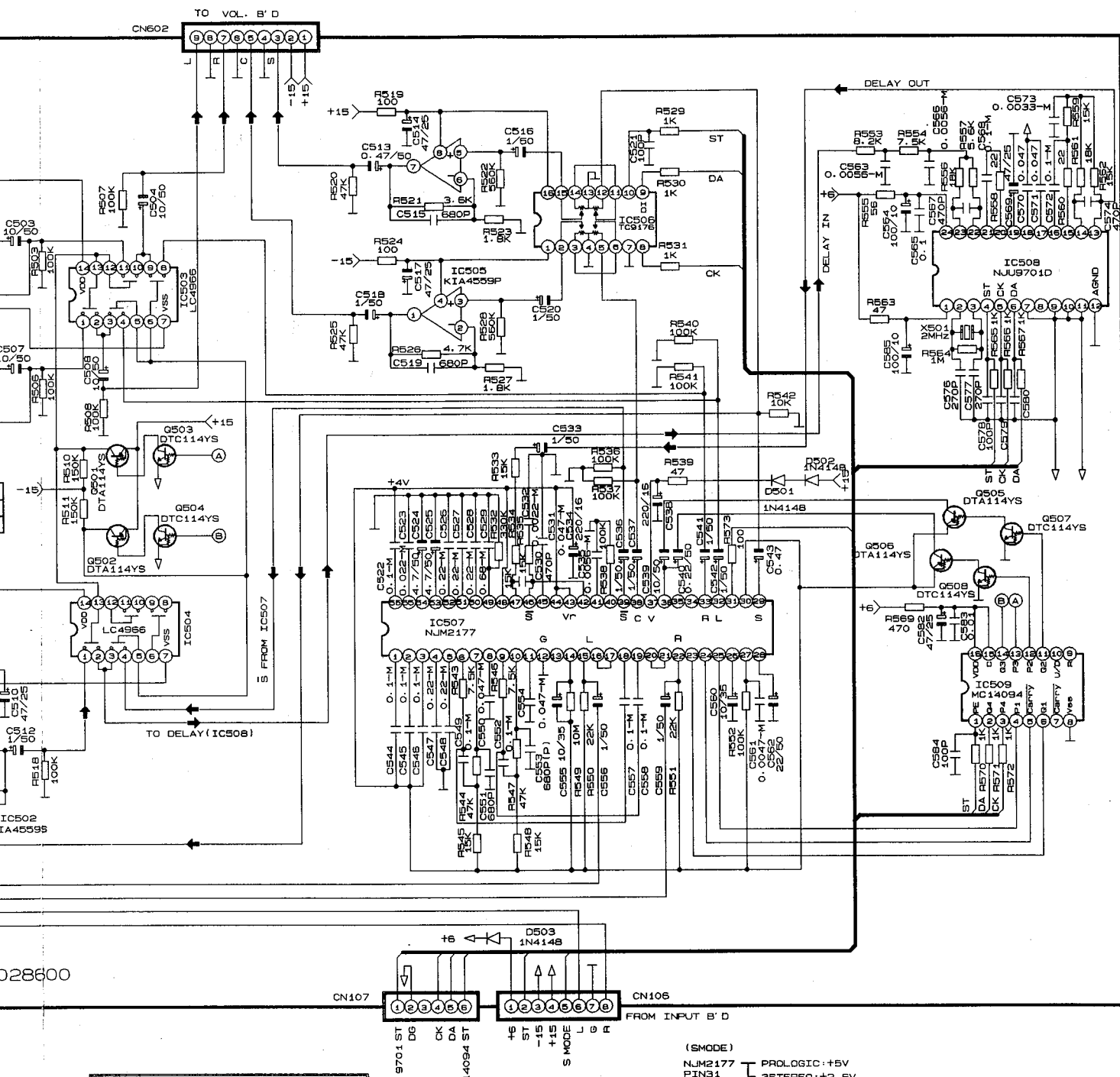
REVISED			
NO.	DATE	NO.	DATE
1		6	
2		7	
3		8	
4		9	
5		10	

(SMODE)  
 NJM2177  
 PIN31  
 PROLOGIC: +5V  
 3STEREO: +2.5V  
 HALL: +5V  
 OFF: 0V

### SCHEMATIC DIAGRAM II



**NOTE**  
1. R  
on  
2. C  
m  
9  
**CAU**  
Safe  
dur  
118  
a  
u  
p  
218  
c  
c  
t  
a  
9



# NOTES

1. Resistor values are indicated in ohms unless otherwise specified [K=1,000 M=1,000,000]
2. Capacitor values are indicated in microfarads unless otherwise specified. [p=micro-microfarads]

## CAUTION

Safety precaution to be followed during servicing

- 1) Since those parts marked with a triangle are critical parts for safety, use only the one described in the parts list
- 2) Before returning the set to the customer make appropriate leakage current or resistance measurements to determine the exposed parts are properly insulated from the supply circuit.

## REVISED

NO.	DATE	NO.	DATE
1		6	
2		7	
3		8	
4		9	
5		10	

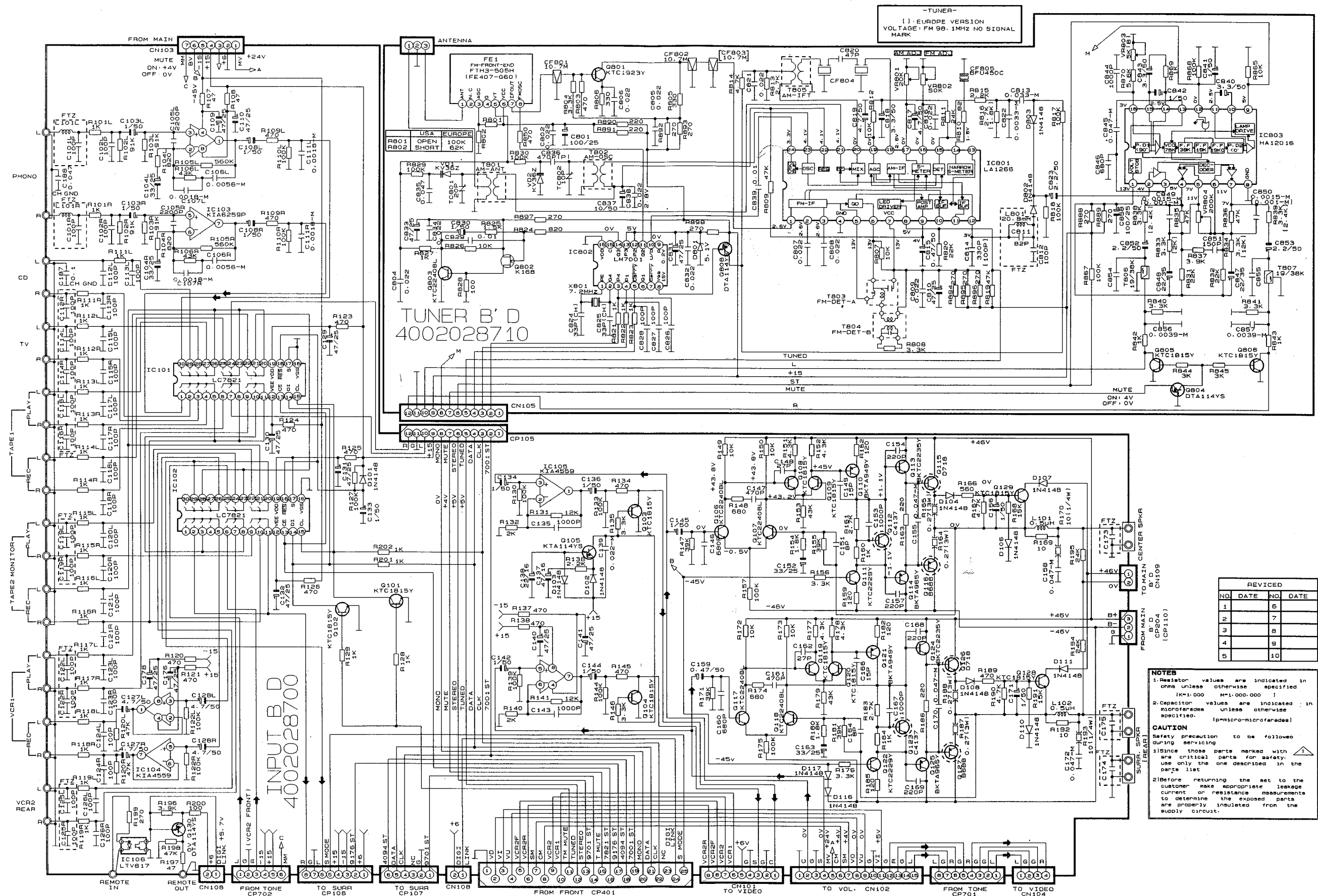
(SMODE)

NJM2177

PIN31

- PROLOGIC: +5V
- 3STEREO: +2.5V
- HALL: +5V
- OFF: 0V

## SCHEMATIC DIAGRAM III

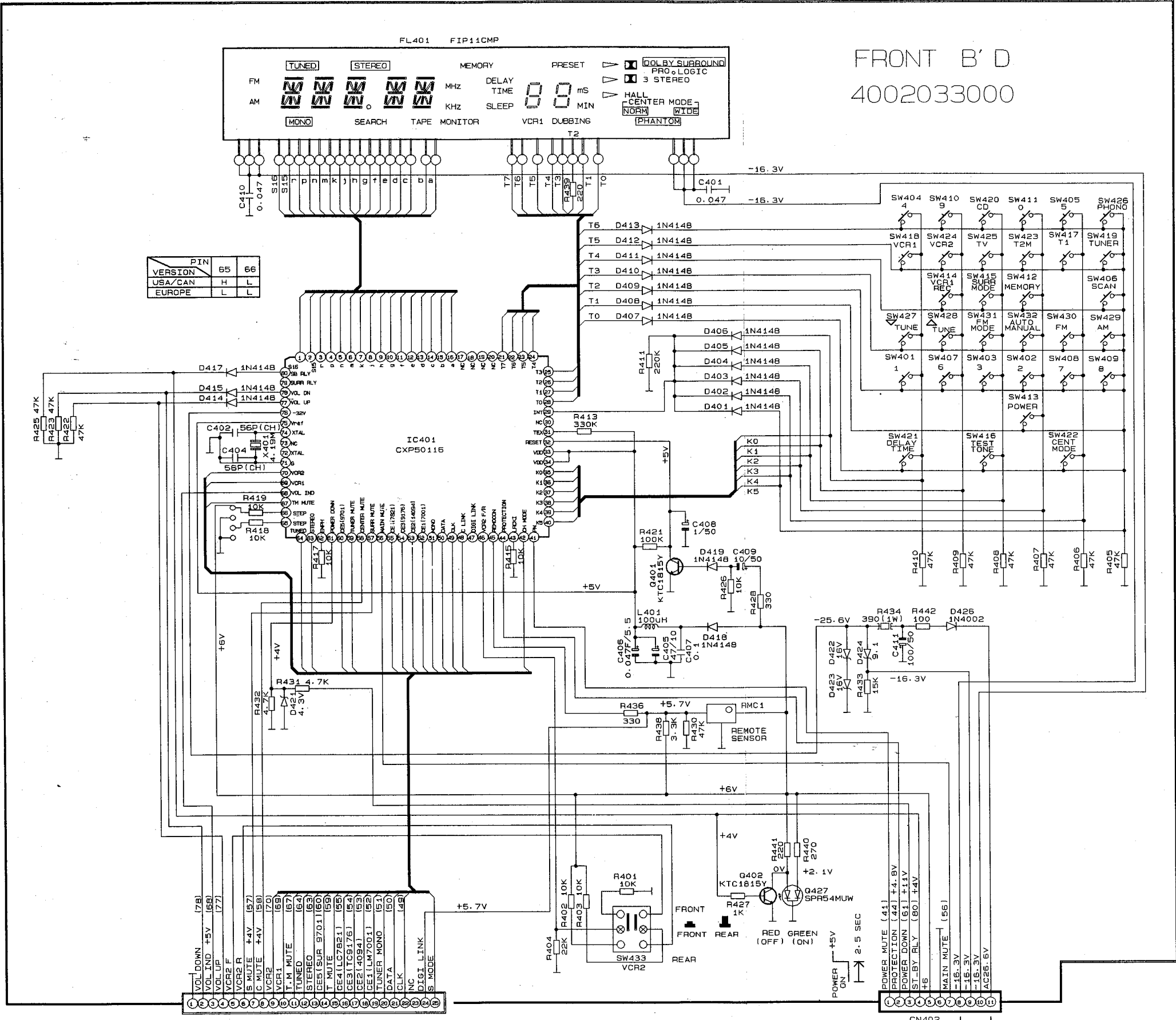




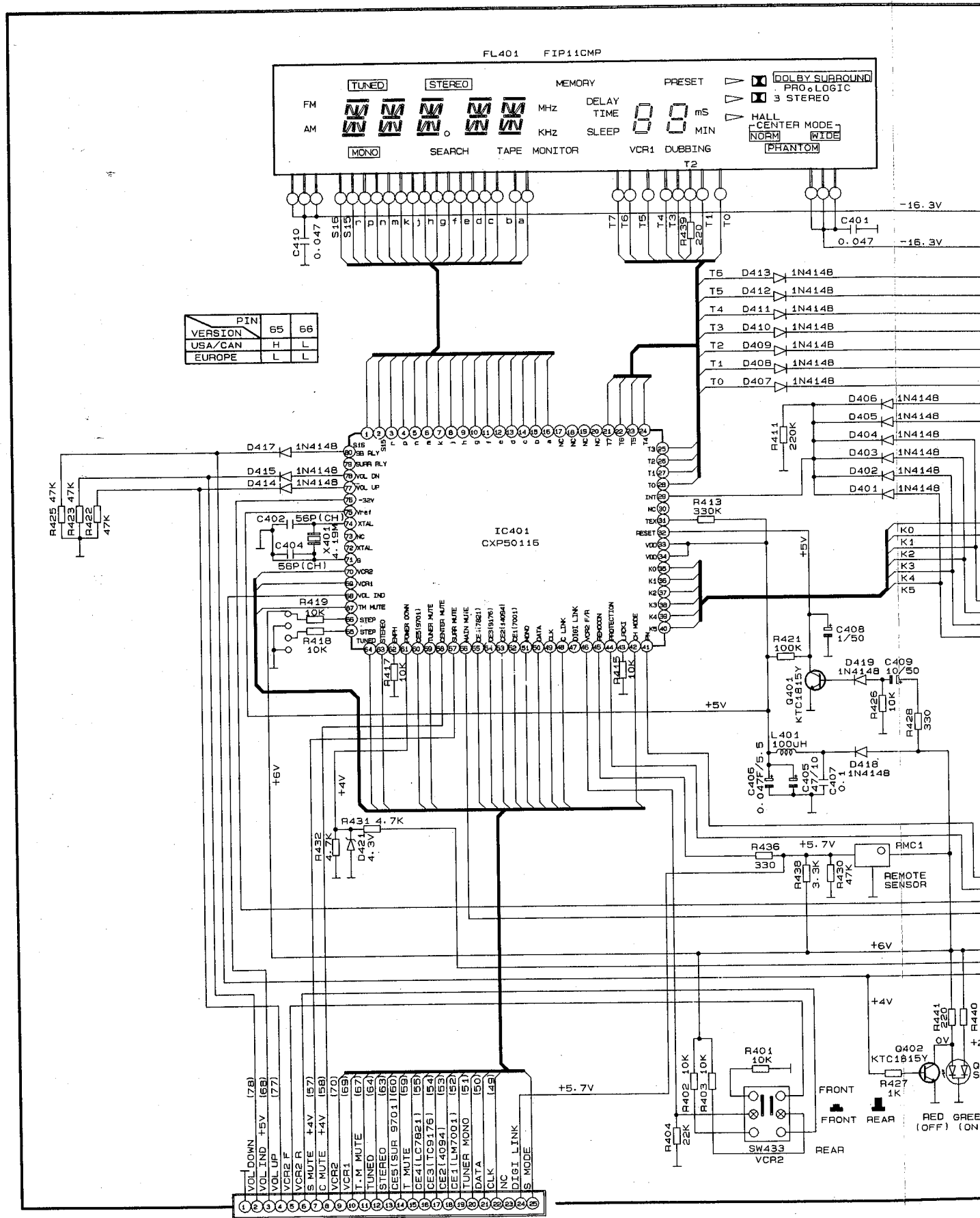




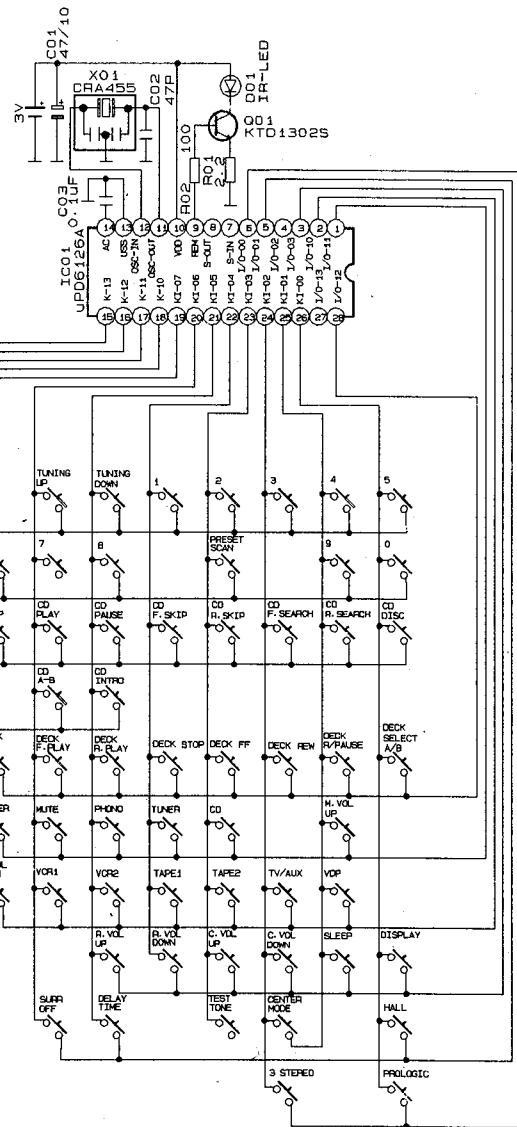
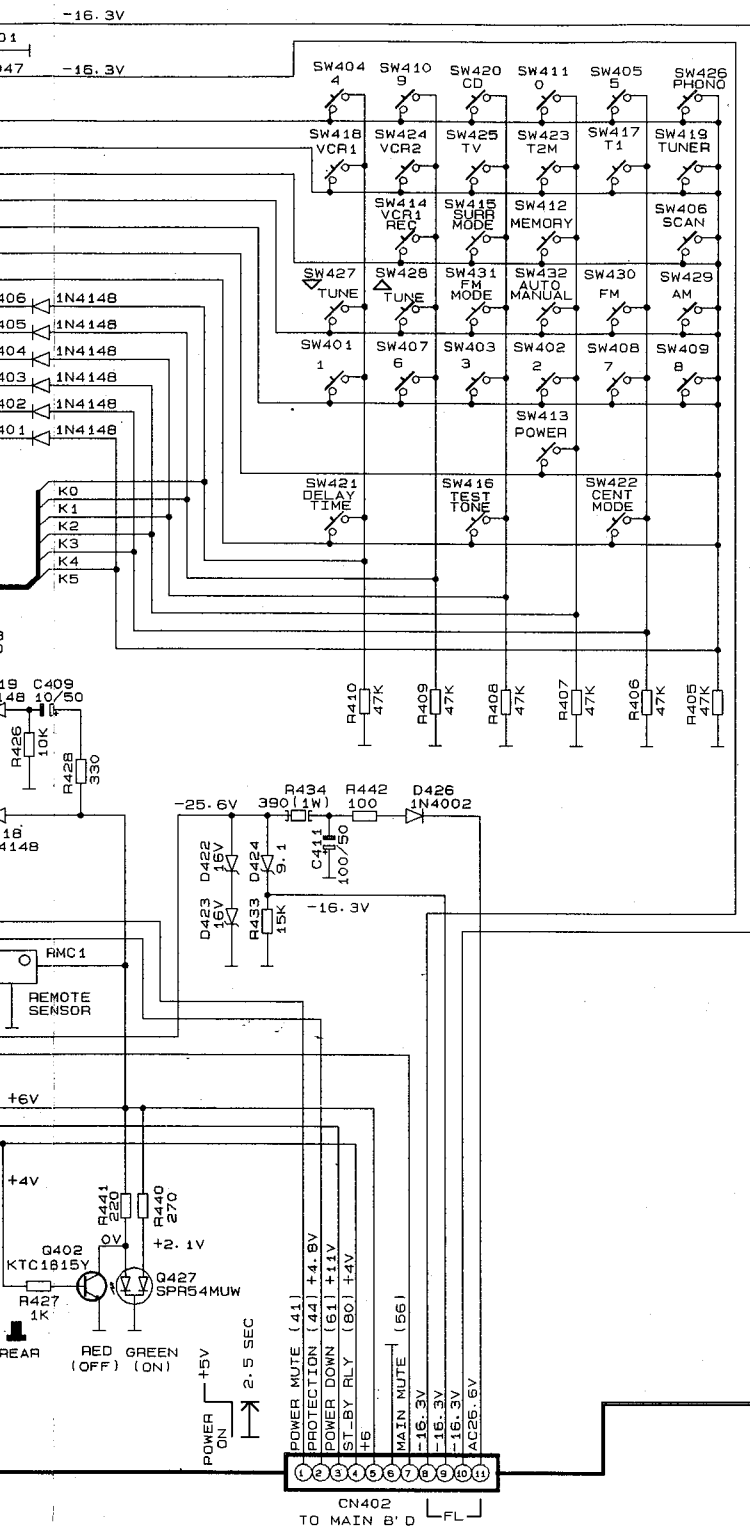
SCHEMATIC DIAGRAM IV



## SCHEMATIC DIAGRAM IV



# FRONT B' D 4002033000



## COMMANDER B' D 4008500200

REVISED			
NO.	DATE	NO.	DATE
1		6	
2		7	
3		8	
4		9	
5		10	

- NOTES**
1. Resistor values are indicated in ohms unless otherwise specified.  
(K=1,000 M=1,000,000)
  2. Capacitor values are indicated in microfarads unless otherwise specified.  
(p=micro-microfarads)
- CAUTION**
- Safety precaution to be followed during servicing
- 1) Since those parts marked with a triangle are critical parts for safety, use only the one described in the parts list.
  - 2) Before returning the set to the customer make appropriate leakage current or resistance measurements to determine the exposed parts are properly insulated from the supply circuit.